

FINAL

MISSION BAY SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

CITY AND COUNTY OF SAN FRANCISCO PLANNING DEPARTMENT • SAN FRANCISCO REDEVELOPMENT AGENCY

PLANNING DEPARTMENT FILE NO. 96.771E

SAN FRANCISCO REDEVELOPMENT AGENCY CASE NO. ER 919-97

STATE CLEARINGHOUSE NO. 97092068

DRAFT SEIR PUBLICATION DATE: APRIL 11, 1998 • DRAFT SEIR PUBLIC HEARING DATE: MAY 12, 1998

DRAFT SEIR PUBLIC COMMENT PERIOD: APRIL 11, 1998 TO JUNE 9, 1998

FINAL SEIR CERTIFICATION DATE: SEPTEMBER 17, 1998

VOLUME IV:
APPENDICES





SOURCE: San Francisco Redevelopment Agency

- | | | |
|--|---|---|
| COMMERCIAL INDUSTRIAL | MISSION BAY OPEN SPACE
(allows recreation-serving retail building east of Terry A. Francois Blvd.) | ADDITIONAL BAYFRONT OPEN SPACE
(PORT PROPERTY) |
| COMMERCIAL INDUSTRIAL / RETAIL | HOTEL | MISSION BAY PUBLIC FACILITIES |
| MISSION BAY NORTH RETAIL | UCSF (includes City school site) | PROPOSED BOUNDARIES OF MISSION BAY REDEVELOPMENT AREAS |
| MISSION BAY RESIDENTIAL | | |

COMBINATION OF PROJECT FEATURES AND VARIANTS AS ADOPTED

SEE INSIDE BACK COVER FOR THE LAND USE PROGRAM ANALYZED AS THE PROJECT IN THE DRAFT EIR



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Final SEIR Certification Date: September 17, 1998

VOLUME IV APPENDICES

- Indicates material that is new or has been revised since publication of the Draft SEIR.

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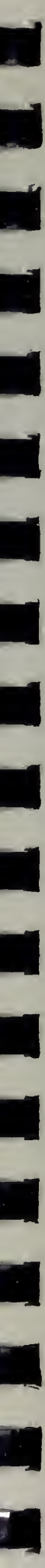
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APPENDICES

APPENDICES

A. INITIAL STUDY



PLANNING DEPARTMENT

City and County of San Francisco 1660 Mission Street San Francisco, CA 94103-2414

(415) 558-6378

PLANNING COMMISSION
FAX: 558-6409

ADMINISTRATION
FAX: 558-6426

CURRENT PLANNING/ZONING
FAX: 558-6409

LONG RANGE PLANNING
FAX: 558-6426

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT

DATE: September 19, 1997

TO: Responsible and Trustee Agencies

FROM: Planning Department and San Francisco Redevelopment Agency
City and County of San Francisco 770 Golden Gate Avenue
Office of Environmental Review San Francisco, CA 94012
1660 Mission Street
San Francisco, CA 94103-2414

RE: Notice of Preparation of a Draft Subsequent Environmental Impact Report

The City and County of San Francisco and the San Francisco Redevelopment Agency will be joint Lead Agencies and will prepare an Environmental Impact Report for the following project:

96.771E: MISSION BAY REDEVELOPMENT PLANS (SFRA Case No. ER 919-97)

Proposed establishment of two Redevelopment Areas (Mission Bay North and Mission Bay South) and adoption of two Redevelopment Plans and associated documents and actions to develop an urban mixed-use community consisting primarily of residential, commercial-industrial, retail, educational (a major new University of California at San Francisco campus) and open space uses, together with supporting infrastructure (including new streets), community facilities and other public improvements, in an approximately 303-acre area located in the eastern central portion of San Francisco. An expanded description of the project, and a list of the potential environmental effects are included in the attached materials.

We need to know the views of your agency as to the scope and content of the environmental information which is germane to your agency's statutory responsibilities in connection with the proposed project. Your agency may need to use the EIR when considering a permit or other approval for the project.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but no later than 30 days after receipt of this notice. Please send your response to Paul Deutsch [(415) 558-6383] at the San Francisco Planning Department address shown above. Please include the name of a contact person in your agency.

Paul A. Deutsch for

Hillary E. Gitelman Date
Environmental Review Officer

Stanley Muraoka

Stanley Muraoka, EIR Program Administrator Date
San Francisco Redevelopment Agency



PLANNING DEPARTMENT

City and County of San Francisco

1660 Mission Street

San Francisco, CA 94103-2414

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LONG RANGE PLANNING
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NOTICE THAT AN ENVIRONMENTAL IMPACT REPORT IS DETERMINED TO BE REQUIRED

DATE OF THIS NOTICE: September 20, 1997

LEAD AGENCY: Planning Department-City & County of San Francisco
1660 Mission Street, 4th Floor
San Francisco, CA 94103

AGENCY CONTACT PERSON: Paul Deutsch
Telephone: (415) 558-6383

PROJECT TITLE: 96.771E - Mission Bay Redevelopment Plans
SPONSOR: San Francisco Redevelopment Agency, SFRA Case No. ER 919-97
PROJECT CONTACT PERSON: Stanley Muraoka, (415) 749-2577

PROJECT ADDRESS: Approximately 303 acres, generally bounded by Townsend and King Streets on the north, Seventh and Pennsylvania Streets on the west, Mariposa Street on the south, and Terry A. Francois Boulevard (formerly China Basin Street) and Third Street on the east.

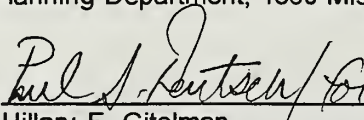
ASSESSORS BLOCK & LOT: Various
CITY AND COUNTY: San Francisco

PROJECT DESCRIPTION: Proposed establishment of two Redevelopment Areas (Mission Bay North and Mission Bay South) and adoption of two Redevelopment Plans and associated documents and actions to develop an urban mixed-use community consisting primarily of residential, commercial, light industrial, educational (a major new University of California at San Francisco campus) and open space uses, together with supporting infrastructure (including new streets), community facilities and other public improvements. Refer to attached materials for more details.

THIS PROJECT MAY HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT AND AN ENVIRONMENTAL IMPACT REPORT IS REQUIRED. This determination is based upon the criteria of the Guidelines of the State Secretary for Resources, Sections 15064 (Determining Significant Effect), 15065 (Mandatory Findings of Significance). The Environmental Impact Report will meet the requirements of the California Environmental Quality Act (CEQA). Potential environmental effects of the proposed project to be evaluated in the EIR are listed in the attached materials.

Deadline for filing of an Appeal of this Determination to the City Planning Commission: October 10, 1997. An appeal requires: (1) a letter specifying the grounds for the appeal, and (2) a \$209 filing fee.

The public is invited to comment on the scope of the EIR. Written comments must be received by October 24, 1997 to ensure consideration in preparing the Draft EIR, and should be mailed to Paul Deutsch, San Francisco Planning Department, 1660 Mission Street, San Francisco, CA 94103.


Hillary E. Gitelman
Environmental Review Officer

**96.771E: MISSION BAY REDEVELOPMENT PLANS
SUBSEQUENT ENVIRONMENTAL IMPACT REPORT
(SFRA Case No. ER 919-97)**

PROJECT DESCRIPTION: The proposed project consists of a proposed new development plan for the Mission Bay area, approximately 303 acres generally south of Townsend Street, east of Seventh Street and I-280 freeway, and north of Mariposa Street (Refer to Figure 1, Project Location). The plan calls for about 6,090 housing units north and south of China Basin Channel; about 1.5 million sq. ft. of retail space; a major new University of California San Francisco (UCSF) campus on about 44.7 acres north of 16th Street, to include up to 2,650,000 sq. ft. of instruction, research and development, administrative and support space; about 5,557,000 sq. ft. of research and development/light manufacturing/office space surrounding the campus to its west, south and east; a 500 room hotel between Third and Fourth Streets south of China Basin Channel; and about 45 acres of open space. The plan also would develop supporting infrastructure (including new streets), community facilities, and other public improvements. Refer to Figure 2, Proposed Land Use Development Program.

To implement the plan, two Redevelopment Areas would be created and two Redevelopment Plans adopted: Mission Bay North and Mission Bay South, divided by China Basin Channel. Each Plan would have a companion Design for Development document, which would essentially constitute zoning and design standards for each Plan area. Project sponsors are the San Francisco Redevelopment Agency for the Redevelopment Plans and Catellus Development Corporation (the primary landowner) for the development proposal.

The site is located about one mile south of downtown San Francisco, and is mostly a large former railyard now occupied by low intensity industrial/warehousing uses, with many vacant or underutilized areas. The site consists primarily of Bay fill.

ENVIRONMENTAL IMPACT REPORT: A previous Environmental Impact Report (Case No. 86.505E, SCH No. 86070113, certified August 23, 1990) was prepared for a prior proposed development program that was ultimately adopted as the Mission Bay Area Plan, an Element of the San Francisco General Plan, and implementing zoning. Development under the Mission Bay Area Plan and zoning was never realized and a different development program is now being proposed.

Because the changes proposed for development of the Mission Bay area are substantial and could involve new or more severe significant environmental effects, a subsequent EIR (SEIR) will be prepared pursuant to CEQA Guidelines Section 15162. An **Initial Study** has been prepared which describes the project in more detail, evaluates whether sufficient environmental analysis was done in the 1990 EIR to adequately evaluate the environmental consequences of the currently proposed project, and which identifies those environmental issues that will require further study in the SEIR. The Initial Study is available at the Planning Department Public Information Counter, 1660 Mission Street, San Francisco, first floor.

The SEIR will be a program EIR pursuant to CEQA Guidelines Section 15168, and a redevelopment plan EIR pursuant to CEQA Section 21090 and CEQA Guidelines Section 15180. A program EIR is an EIR prepared for a series of actions that can be characterized as one large project, related geographically and in connection with issuance of rules, regulations, plans, and

other general criteria to govern the conduct of a continuing program.

The SEIR will analyze impacts based on 100% buildout of the Project Area by year 2015. Although 100% buildout is not expected to occur by this time, this conservative assumption will ensure that impacts are not understated.

ENVIRONMENTAL ISSUES: The Initial Study proposes that environmental effects related to the following topics will be analyzed in the SEIR due to changes in the project and/or changes in circumstances since the 1990 EIR: compatibility with existing zoning, plans, and public policies; land use; visual quality; population; transportation; noise; air quality; community services and utilities except those listed below (i.e., fire protection, police protection, public health services, recreation and parks, schools, solid waste disposal, water supply, sewers and wastewater treatment, power supply, and telecommunications will be covered); biotic resources associated with China Basin Channel; seismic hazards; tsunami and seiche hazards; water quality; hazardous materials and hazardous wastes; and the potential architectural/historic resource of Fire Station 30.

The Initial Study has proposed that the following topics were adequately covered in the 1990 EIR and will be summarized but not covered in detail in the SEIR: construction noise; shadows; wind; child care, library, ambulance, and street maintenance services; vegetation and wildlife, except that associated with China Basin Channel; topographical changes; ground settlement; inundation and flooding; construction dewatering; energy; cultural resources; and architectural/historic resources except for Fire Station 30.

ALTERNATIVES: The SEIR will analyze three Alternatives to the proposed project:

1. No Project (a brief discussion of a "no project, no change" alternative in which the project area remains as it is through the analysis year of 2015, and a more detailed analysis of project area partial buildout under existing zoning according to Association of Bay Area Governments (ABAG) Projections '96);
2. Adoption of Mission Bay North Redevelopment Plan, no change in existing zoning/plans for Mission Bay south of China Basin Channel (Buildout of Mission Bay north of China Basin Channel according to the proposed project, plus partial buildout south of the Channel under existing zoning according to ABAG Projections '96).
3. Reduced Development (similar to Alternative B from the 1990 EIR -- mostly housing, retail and open space uses, with limited amounts of office and research/development activities).

For further information concerning **environmental review** of the Mission Bay project, contact Paul Deutsch of the San Francisco Planning Department at (415) 558-6383. For further information concerning the **Mission Bay project and process**, contact David Prowler, Office of the Mayor, (415) 554-7940. The Initial Study is available at the Planning Department Public Information Counter, 1660 Mission Street, San Francisco, first floor.

MISSION BAY SUBSEQUENT EIR INITIAL STUDY

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MISSION BAY
SUBSEQUENT EIR
INITIAL STUDY
96.771E
SFRA Case No. ER919-97

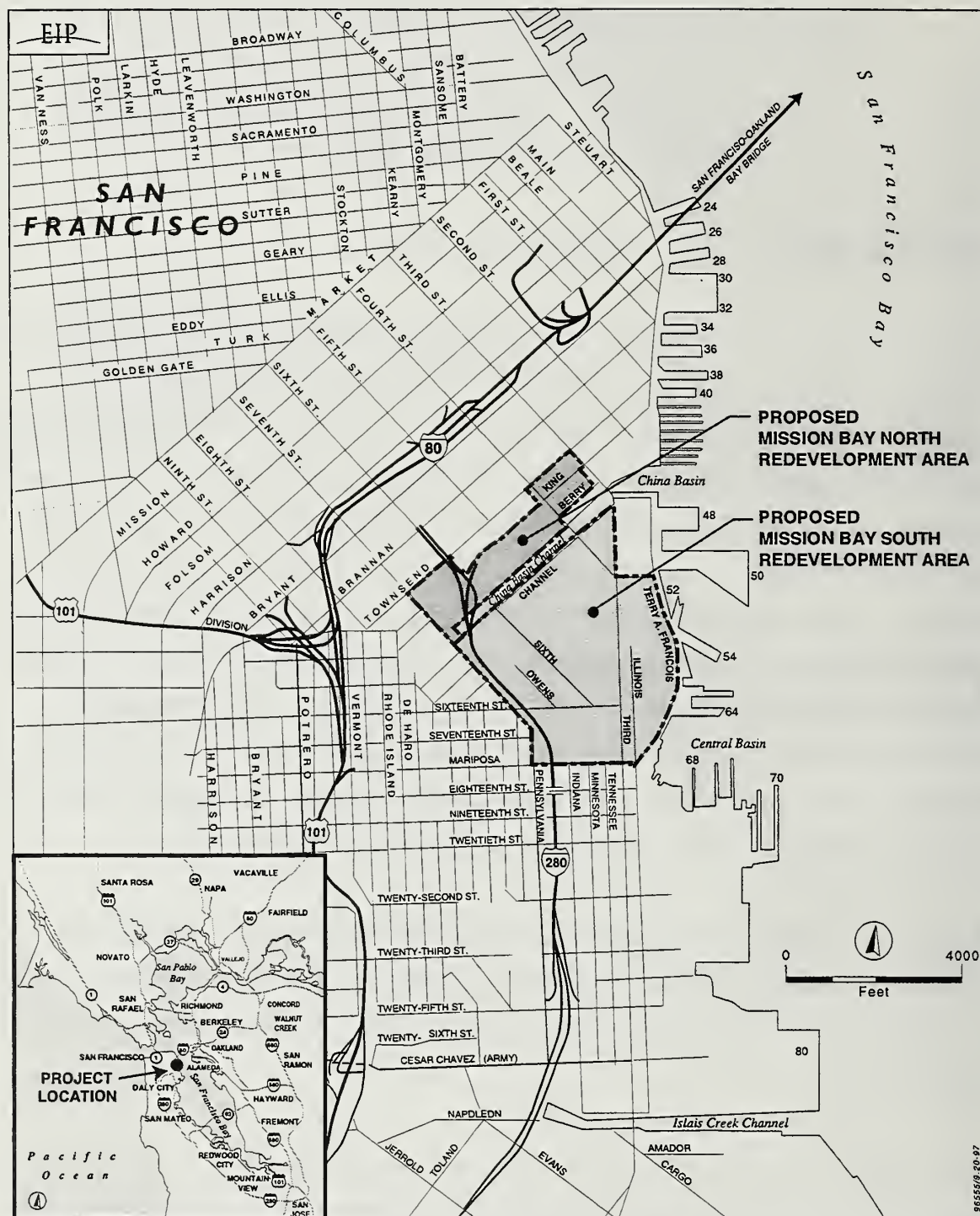
I. INTRODUCTION

The proposed Mission Bay North and Mission Bay South Redevelopment Plans would permit development of an urban mixed-use community consisting of primarily residential, commercial, industrial, retail, educational (a new UCSF site) and open space uses, including major new infrastructure and public facilities. The project would be located near the eastern shoreline of the City and County of San Francisco, California (the City), about one mile south of the City's downtown financial district. The Mission Bay Project Area (Project Area) comprises an approximately 303-acre area north and south of China Basin Channel, generally bounded by Townsend or King Streets on the north, Seventh and Pennsylvania Streets on the west, Mariposa Street on the south, and Terry A. Francois Boulevard (formerly China Basin Street) and Third Street on the east. Figure 1 shows the location of Mission Bay in the San Francisco Bay Area and within the City. The project consists of two proposed Redevelopment Plans: Mission Bay North and Mission Bay South.

In the late 1980's, the City prepared an Environmental Impact Report pursuant to the California Environmental Quality Act analyzing several development alternatives for Mission Bay. The *Mission Bay Final Environmental Impact Report* (1990 FEIR) was certified in August 1990.¹

A specific plan and zoning based on one of the alternatives evaluated in the 1990 FEIR were ultimately adopted, and a development agreement was approved between the City and the

1. City and County of San Francisco, Department of City Planning, *Mission Bay Final Environmental Impact Report* (Planning Department File No. 86.505E, State Clearinghouse No. 86070113), certified August 23, 1990.



MISSION BAY SEIR INITIAL STUDY

FIGURE 1 PROJECT LOCATION

dominant landowner to implement the plan. Market conditions changed, and the project was never begun. In April 1996, the development agreement was terminated. In 1996 and 1997, Catellus Development Corporation (Catellus), the owner of most of the land in the Project Area, and the City reached conceptual agreements on a land use development program for the Project Area, subject to obtaining the necessary governmental approvals and requirements of CEQA and any modifications as a result of the environmental review process. The University of California San Francisco (UCSF) decided in 1997 to locate its major new campus site (Major New Site, herein referred to as the "UCSF site") in Mission Bay, thus playing a pivotal role in the land uses proposed for the area south of China Basin Channel. The new UCSF site is expected to attract to Mission Bay South biotechnology and medical research firms interested in close interaction with UCSF. The conceptual agreements will be embodied in the proposed Redevelopment Plans for Mission Bay North and Mission Bay South.

The proposed project requires environmental review under the California Environmental Quality Act (CEQA). The Planning Department and the San Francisco Redevelopment Agency are co-lead agencies under CEQA for the project. Because of substantial changes proposed in the Mission Bay project, and substantial changes in the larger setting and context, a Subsequent Environmental Impact Report (Subsequent EIR or SEIR), that builds upon the analysis performed in the 1990 FEIR will be prepared.

Pursuant to State CEQA Guidelines Section 15063(b)(1)(c), this Initial Study evaluates which of the current project's effects were adequately examined in the 1990 FEIR to identify those environmental issues which will require further study in the SEIR. Pursuant to CEQA Section 21061, the Initial Study and SEIR will use and reference, to the extent possible, information contained in the 1990 FEIR. The information from the 1990 FEIR that is incorporated by reference in this Initial Study is summarized in the relevant sections.

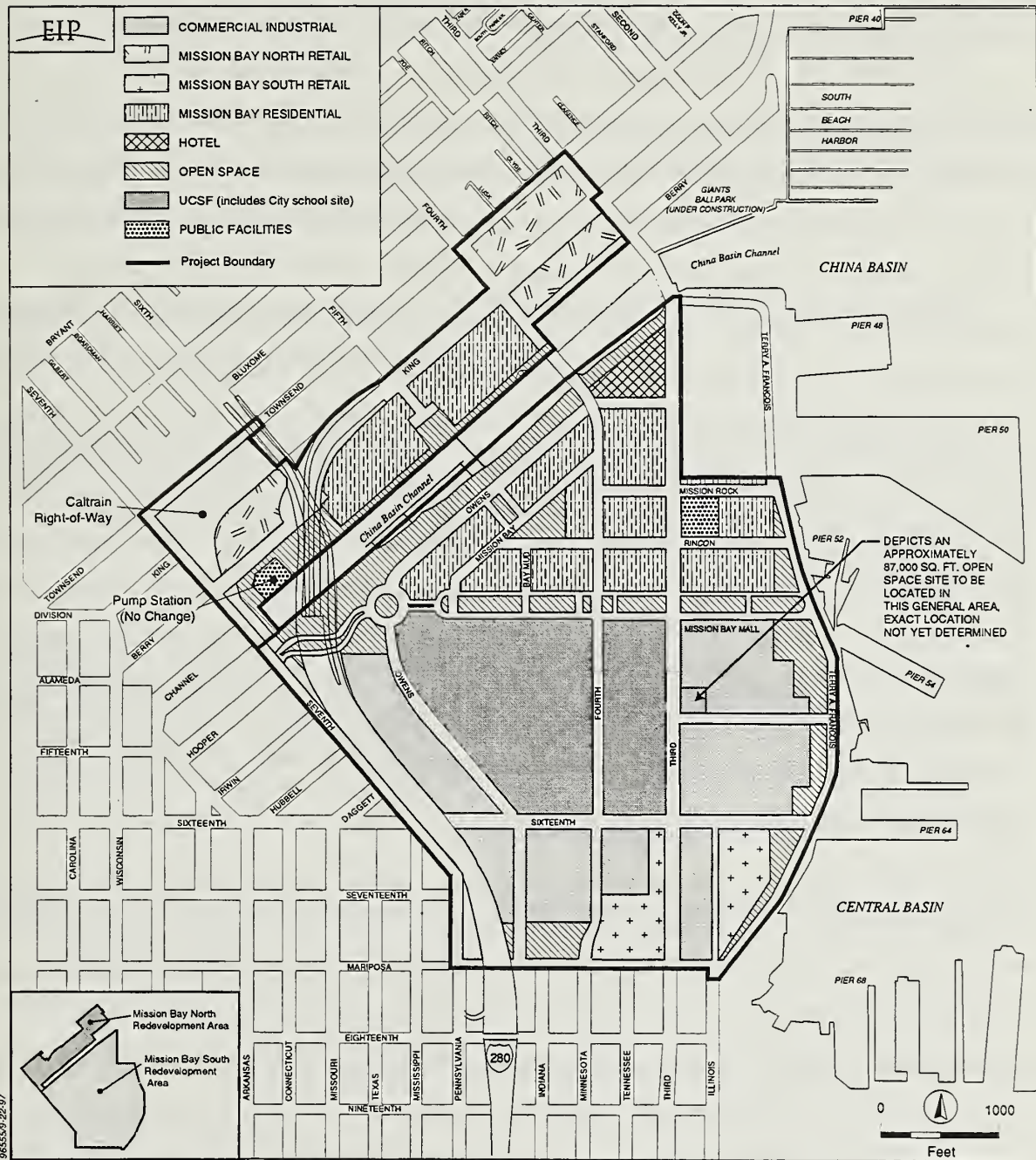
II. PROJECT DESCRIPTION

The approximately 303-acre Mission Bay Project Area would be developed into an urban mixed-use community consisting of primarily residential, commercial, industrial, retail, educational, and open space uses. The “project” for the Mission Bay Subsequent EIR includes this land use development program as provided for in the proposed Mission Bay North Redevelopment Plan and the Mission Bay South Redevelopment Plan shown in Figure 2; new streets, infrastructure, other public improvements, and community facilities; conforming amendments to the San Francisco General Plan and other land use plans; and conforming amendments to the City Planning Code. Included in each of the two Redevelopment Plans are design guidelines, called Design for Development documents. The Redevelopment Plans and Design for Development documents would comprise the permitted land uses and primary development controls for the Project Area.

Figure 2 illustrates the proposed land use development program and the new street pattern. The project includes 5,557,000 gross square feet (gross sq. ft.) of commercial industrial uses, 2,650,000 gross sq. ft. of UCSF site uses, about 6,090 residential units, 805,000 gross sq. ft. of city-serving retail,² 445,000 gross sq. ft. of entertainment-oriented retail, 257,000 gross sq. ft. of neighborhood-serving retail, 500 hotel rooms, community facilities and about 49 acres of open space.

North of the China Basin Channel (the “Channel”), about 222,000 gross sq. ft. of city-serving retail would be developed on the west. Approximately 3,000 residential units would border the north side of the Channel,³ along with about 56,000 gross sq. ft. of neighborhood-

-
2. “City-serving” retail is retail that draws customers from the entire City, as compared to “neighborhood-serving” retail that primarily draws customers only from the immediate neighborhood.
 3. Of the 3,000 dwelling units north of Channel, 20% would be affordable units. Of the 3,090 dwelling units south of the Channel, the Redevelopment Agency would select nonprofit developers to build approximately 1,100 affordable units on approximately 12.2 acres of land dedicated to the Agency by Catellus. “Affordable units” are dwelling units with rents or purchase prices affordable to a household whose income is no greater than 80% of the median income for households in San Francisco (Article 25 of the California Code of Regulations Section 6932).



MISSION BAY SEIR INITIAL STUDY
FIGURE 2 PROPOSED LAND USE DEVELOPMENT PROGRAM

serving retail. Up to 389,000 gross sq. ft. of entertainment-oriented commercial uses would be located across Third Street from the approved San Francisco Giants Ballpark.

South of the Channel, approximately 3,090 residential units would border the south side of the Channel and extend across Third Street. A 500-room hotel and up to 56,000 gross sq. ft. of entertainment-oriented commercial uses would be located alongside the Channel adjacent to Third and Fourth Streets. Commercial industrial uses consisting of research and development, light industrial, and office uses would primarily form the western, southern and eastern border of the Project Area. There would be up to 5.56 million gross sq. ft. of such uses. Up to 583,000 gross sq. ft. of city-serving retail would be developed south of 16th Street, both east and west of Third Street. Within and around the residential and commercial industrial areas, there would be up to 201,000 gross square feet (gross sq. ft.) of neighborhood-serving retail.

Located in the center of the Project Area would be the major new campus site identified in the 1996 Long Range Development Plan (UCSF LRDP), adopted by The Regents of the University of California in January 1997. The approximately 43-acre UCSF site would provide up to 2,650,000 gross sq. ft. of space.⁴

The UCSF site would be focused largely on research and development activities which in turn are expected to attract research and development firms, such as biotechnology, semiconductor, computer, or other types of research and development operations; multi-media, and/or software companies; light manufacturing; and office uses.

4. The campus would include up to 2,650,000 gross sq. ft. of instruction, research, and administrative space at full build-out, exclusive of parking. UCSF plans to build approximately 160,000 gross sq. ft. of classroom space, 1,220,000 gross sq. ft. of research space, and 1,270,000 gross sq. ft. of "support" space. The research space would include laboratories. There would be no "clinical" space, meaning no hospital, clinics, or doctors' offices for seeing patients. UCSF, *University of California San Francisco Long Range Development Plan: Science and Health for the 21st Century*, January 1997, p. 170.

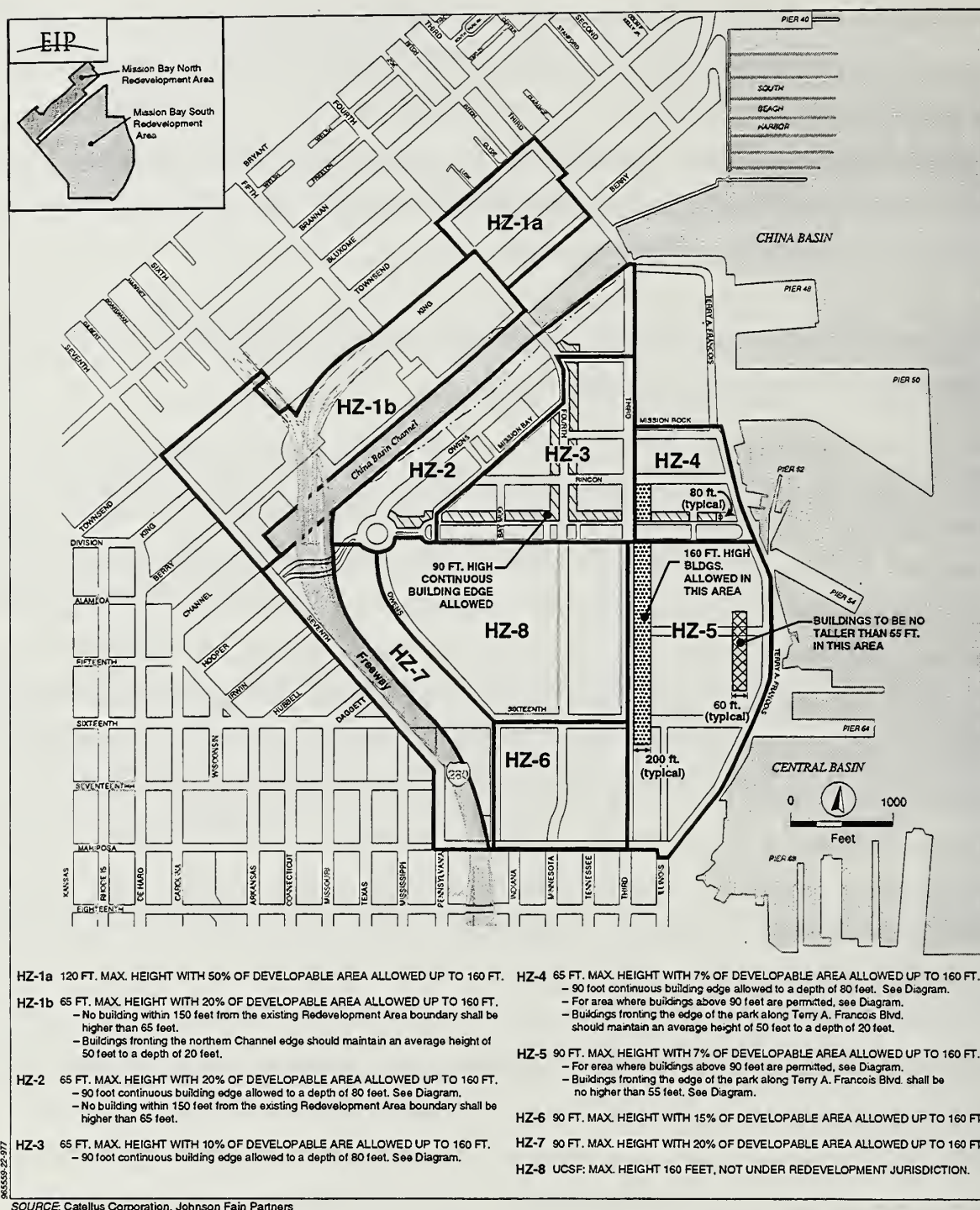
There would be a variety of open space areas both north and south of the Channel, a possible pedestrian bridge across the China Basin Channel at Fifth Street, a site for a public school, and a site for police and fire stations. The existing Channel Street Pump Station at the western end of the China Basin Channel would be retained. The Caltrain terminal at Fourth and Townsend Streets and the Mission Creek Marina in China Basin Channel are outside the Project Area and are not part of the project.

Temporary and interim uses would be permitted throughout the Project Area pending ultimate buildout with development program uses.

Height limits for the Project Area would be established by height zones adopted as part of the proposed Redevelopment Plans and Design for Development documents. Figure 3 shows the proposed height zones. Most of the height zones provide a basic height maximum, but allow a portion of the developable land area to be built to a higher limit. For example, one of the two height zones nearest to the Bay, HZ-4, has a basic maximum height limit for the entire developable land area within the zone of 65 feet, but a height limit of 160 feet along Third Street south of the police and fire station site, and a height limit of 90 feet along the proposed Mission Bay Mall. The other height zone near the Bay, HZ-5, has a basic maximum of 90 feet, with 7% of the developable land area allowed to rise to 160 feet, and a strip adjacent to the open space limited to 55 feet. In Height Zone 7 next to I-280, 80% of the developable land area would have a height limit of 90 feet, and 20% of the developable area would have a height limit of 160 feet.

The UCSF LRDP contains an analysis of building heights; however, because UCSF has not yet established siting and design details such as building heights for the UCSF site, the UCSF LRDP analysis is somewhat generalized. For purposes of conservative analysis, it is assumed that building heights will be similar to adjacent Mission Bay height zones, with selected buildings up to 160 feet in height.

Catellus would convey approximately 1.26 acres adjacent to the old Fire Station 30 building to the City for police and fire stations within Mission Bay South.



MISSION BAY SEIR INITIAL STUDY
FIGURE 3 HEIGHT ZONE DIAGRAM

Catellus would convey approximately 2.2 acres to the City for possible construction of a public school. The site would be located within the approximately 43-acre UCSF site area and would be available to the San Francisco Unified School District.

The project would include approximately 43 acres of four different types of open space: linear parks, parks, neighborhood parks, and small open spaces. Linear parks would be built along the edges of China Basin Channel, along Terry A. Francois Blvd., and along an east-west axis in roughly the center of the Mission Bay South Redevelopment Area (referred to as the "Mission Bay Mall"). Parks would feature formal sporting facilities, such as tennis courts, volleyball courts, and jogging and bicycling paths. Neighborhood parks would provide areas for children's play, walking, and sitting. There would be various other small open spaces, such as "pocket parks," courtyards, podiums, alleys, and arcades. The UCSF site would contain about eight acres of plazas, walkways, and sporting facilities which would be accessible to the surrounding community.

Table 1 summarizes the land uses proposed in the Mission Bay project.

The existing street pattern would be changed, although Third Street, 16th Street, and the lower portion of Owens Street would remain in substantially their current alignment. Owens Street would be extended south to Mariposa Street and north to a roundabout and then northeast along the southern Channel edge to Fourth Street, replacing Channel Street. Berry Street would be closed between Fourth and Sixth Streets, except for driveway access to residential buildings, and it would be replaced by housing and a pedestrian mall. Fourth Street would be realigned south of the Channel; Fourth Street would no longer intersect with Third Street, but would run south parallel to Third Street, ending at Mariposa Street opposite Minnesota Street's intersection with Mariposa Street. A series of new east-west streets would be created, as shown on Figure 2.

TABLE 1
MISSION BAY LAND USE DEVELOPMENT

	Mission Bay North Redevelopment Area	Mission Bay South Redevelopment Area	Grand Total /a/
Size (acres)	65	238	303
Residential (dwelling units)	3,000	3,090	6,090 /b/
Commercial Industrial (gross sq. ft.)	0	5,557,000	5,557,000
UCSF site (gross sq. ft.)	0	2,650,000	2,650,000
City-Serving Retail (gross sq. ft.)	222,000	583,000	805,000
Entertainment-Oriented Retail (gross sq. ft.)	389,000	56,000	445,000
Hotel (rooms)	0	500	500
Neighborhood-Serving Retail (gross sq. ft.)	56,000	201,000	257,000
Public Open Space (acres)	7	41	49 /c/

Notes:

- a. The conceptual agreements between the City and Catellus do not cover portions of the proposed Redevelopment Areas not owned by Catellus. The components of the proposed development program summarized in the Grand Total that are not on land owned by Catellus consist of 90 dwelling units along Third Street, 310,000 gross sq. ft. of city-serving retail on the Castle Metals site, and 250,000 gross sq. ft. of city-serving retail on the Esprit site.
- b. Of the 3,000 dwelling units north of the Channel, 20% would be affordable units. Of the 3,090 dwelling units south of the Channel, the Redevelopment Agency would select nonprofit developers to build up to 1,100 affordable units. "Affordable units" are defined as dwelling units with rents or purchase prices affordable to a household whose income is no greater than 80% of the median income for households in San Francisco (Article 25 of the California Code of Regulations Section 6932).
- c. Totals may not add due to rounding.

Source: Catellus Development Corporation and San Francisco Redevelopment Agency.

The Caltrain terminal and tracks would remain in place. Regarding other rail access, the Port of San Francisco and Catellus have developed a plan for the termination and relocation of rail access through the Project Area. The plan is designed to preserve flexibility for

development while maintaining rail access to Port properties. It provides that existing rail access to Pier 80 will be terminated only when a new rail lead is established and also accommodates the relocation of rail access to Piers 48 and 50 outside of developable parcels in the Project Area. For the purposes of this Initial Study and SEIR, it is assumed that the rail access would be relocated along 16th Street. The project also includes relocation of the existing Seventh Street rail crossing near Hooper Street.

Although not part of the Mission Bay project, the MUNI Third Street Light Rail extension now being planned would be located along Fourth and Third Streets through the Project Area.

To provide a pedestrian link between the northern and southern sides of the Channel, in addition to the existing Peter Maloney and Lefty O'Doul Bridges, the project, subject to obtaining required approvals, may include a pedestrian bridge approximately in alignment with Fifth Street. The bridge would allow boat traffic underneath.

The project would also construct infrastructure improvements to serve the increased urbanization of the Project Area, including sewers, drainage systems, water lines, and utility connections.

III. ENVIRONMENTAL EVALUATION CHECKLIST DISCUSSION

This section summarizes issues which may be significant and therefore warrant further analysis in the SEIR, as well as those issues which require no additional analysis.

The *Mission Bay Subsequent EIR* will incorporate information, as appropriate, from EIRs that have been previously published, particularly the *Mission Bay Final EIR* (Planning Department File No. 86.505E, State Clearinghouse No. 86070113), certified August 23, 1990 (1990 FEIR); the *University of California San Francisco Long Range Development Plan FEIR* (State

Clearinghouse No. 95123032), certified in January 1997 (UCSF LRDP FEIR); and the *San Francisco Giants Ballpark at China Basin Final EIR* (Planning Department File No. 96.176E, State Clearinghouse No. 96102056), certified June 26, 1997 (Giants Ballpark FEIR). As discussed in Section I, Introduction, above, the 1990 FEIR evaluates the impacts of potential development in Mission Bay.⁵ The UCSF LRDP FEIR evaluates the impacts of potential development of a new UCSF site at three potential sites, one of which is Mission Bay. The Giants Ballpark FEIR evaluates a 42,000-seat ballpark and other facilities soon to be under construction adjacent to Mission Bay.

When information from the above EIRs is presented in the *Mission Bay Subsequent EIR*, it will be incorporated by reference with a summary, pursuant to CEQA, Sections 21061 and 21100 (see also State CEQA Guidelines, Section 15150). Those reference documents are available for public review at the Planning Department, Office of Environmental Review, 1660 Mission Street, San Francisco.

A. EFFECTS FOUND TO BE POTENTIALLY SIGNIFICANT

This initial evaluation has determined that the new proposed project could have a number of potentially significant environmental effects that warrant analysis in the SEIR. Effects or issues proposed for analysis include: changes in existing land use, public views from Potrero Hill and other locations, increases in traffic congestion and transit use, increases in traffic noise, increased air pollutant emissions, increased demand for public utilities and services, potential impacts on vegetation and wildlife along China Basin Channel, seismic hazards, inundation hazards from tsunami or seiche, potential water quality effects from construction activities and from storm water runoff, and hazardous materials and hazardous wastes. The

5. The 325-acre project area discussed in the 1990 FEIR differs from the 303-acre Mission Bay Project Area. The 1990 FEIR's project area boundaries included China Basin Channel and land owned by the Port of San Francisco east of Third Street and north of Mission Rock Street, whereas the current Mission Bay Project Area does not include the Channel or this land. Mission Rock Street would be realigned. The 1990 FEIR project area boundary did not include the Castle Metals site at Mariposa and Third Streets, whereas the current Mission Bay Project Area includes this site.

SEIR will also consider whether the project could affect the balance of jobs and housing, or induce growth outside the Project Area.

B. EFFECTS ADEQUATELY COVERED OR FOUND NOT TO BE SIGNIFICANT

The following potential impacts have been determined in this Initial Study, as discussed in detail in Section IV, Environmental Evaluation Checklist, to be either insignificant, mitigated through measures already included in the project, or adequately covered in previous environmental documentation, and therefore do not require further analysis in the SEIR.

Construction Noise. Construction noise was previously examined in the 1990 FEIR, and the impact of the proposed project would not substantially differ from that already analyzed. Compliance with the San Francisco Noise Ordinance would mitigate potential impacts. All development activity, including UCSF, would comply with the San Francisco Noise Ordinance.

Shadows. Although the proposed project involves higher buildings (160 ft. maximum) than those proposed and analyzed in the 1990 FEIR (110 ft. maximum), a preliminary analysis of proposed building height limits indicates shadows would not reach parks operated by the San Francisco Recreation and Park Department. Therefore, under significance criteria relating to Section 295 of the City Planning Code as approved by the voters in 1984, there would be no significant impacts associated with shadows. With respect to shadows within the Project Area, the Redevelopment Agency documents would require analysis of potential shadow on existing and proposed open spaces during the building design and review process. Shadows on China Basin Channel and along the Bay shore, including Agua Vista Park, may increase; however, there would be no significant effects on plants and animals in or near the Channel.

Wind. Although the proposed project involves higher building height limits (160 ft. maximum) than those proposed and analyzed in the 1990 FEIR (110 ft. maximum), the qualitative wind analysis in the 1990 FEIR adequately evaluates the project. Detailed design

information is not yet available for specific buildings so no further study can be undertaken at this time. The Redevelopment Agency documents would require analysis and mitigation of any hazardous wind effects during the building design and review process.

Community Services and Utilities. Provision of child care services in response to project demand at this time is not expected to result in any direct or indirect environmental impacts, and the City Planning Code section pertaining to child care services is not applicable to Redevelopment Areas; therefore, child care needs no further analysis. Library services do not require further analysis because citywide library resources are now greater than at the time of the 1990 FEIR analysis, which concluded library resources would be sufficient for the larger population studied in the 1990 FEIR. Street maintenance services would be provided by the City, following acceptance by the City of new public streets in the Project Area, and would require no further study.

Emergency medical service was provided by the San Francisco Department of Public Health, as described in the 1990 FEIR, until July 1997, when the responsibility was shifted to the San Francisco Fire Department. As noted in the 1990 FEIR, development in the Mission Bay Project Area would likely create a demand for additional paramedic staff, but would not result in a demand for additional buildings housing emergency medical facilities, and therefore would not cause any direct or indirect physical environmental impacts. Therefore, ambulance service needs no further analysis.

Vegetation and Wildlife. No endangered, threatened, or rare plant or animal species are present within upland areas of the Project Area, outside the China Basin Channel. The Project Area supports no native upland vegetation. No significant impacts on vegetation or wildlife would occur in the Project Area outside the China Basin Channel. Therefore no further study of biotic resources outside the Channel area is necessary. The SEIR will evaluate potential effects on biotic resources in the Channel area.

Geologic Hazards. There are no known unique geologic features in the Project Area. Proposed construction would cover most of the ground surface with new structures, paving, or landscaping. New fills as deep as 2.5 feet would be added to low spots in the Project Area, but would cause no substantial change in the essentially flat character of the area's topography. Regarding settlement hazard, most of the proposed buildings would be built on piles, and a variety of methods of reducing settlement hazards in areas not supported by piles would be used. The nature of the geologic deposits, and the issues of topography and settlement will not require further discussion in the SEIR.

Water. Flooding issues for development in Mission Bay were adequately addressed in the 1990 FEIR and will not be further analyzed in the SEIR. Mitigation measures proposed in the 1990 FEIR have been included here to address flooding. Regarding disposal of groundwater extracted for construction (dewatering), the City would require pre-treatment, if necessary, prior to disposal in the sewer system; therefore, no further discussion is needed in the SEIR.

Energy. As discussed in the 1990 FEIR, buildings in Mission Bay would be required by law to comply with either the prescriptive or performance requirements of Title 24 Energy Conservation Standards. Compliance with Title 24 would be enforced by the San Francisco Department of Building Inspection, through the building permit review process. Such compliance would mean that the project would not use energy in a wasteful manner.

Energy consumption estimates for the proposed project are similar to those provided in the 1990 FEIR for Alternative A.⁶ No significant impacts were shown as a result of information in the 1990 FEIR; a review of that information and updated calculations do not show new significant environmental effects from the proposed project. Therefore, the topic will not be discussed further in the SEIR.

6. 1990 FEIR, Volume Two, VI.H.2, p. VI.H.12.

Cultural Resources. The 1990 FEIR thoroughly evaluated the cultural resources of the Project Area, including the Castle Metals site, which was outside the prior project boundaries. The cultural resources analysis showed no significant impacts that could not be mitigated through the imposition of standard mitigation measures. The mitigation measures proposed in the 1990 FEIR have been updated to reflect changes in law and practice. This topic will not be discussed further in the SEIR.

IV. ENVIRONMENTAL EVALUATION CHECKLIST

This section uses the standard city environmental checklist to discuss the SEIR's planned approach to issues identified for further analysis and to fully consider issues which require no further analysis. Mitigation measures related to issues that will not be discussed further in the SEIR are also presented.

A. COMPATIBILITY WITH EXISTING ZONING AND PLANS

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
1. Discuss any variances, special authorizations, changes proposed to the City Planning Code or Zoning Map, if applicable.	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
*2. Discuss any conflicts with any other adopted environmental plans and goals of the City or Region, if applicable.	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

The proposed project consists of the adoption of two Redevelopment Plans and associated Design for Development documents, and the establishment of two Redevelopment Project Areas. It would require amendments to the *San Francisco General Plan* and the City Planning Code,

including the rescission of Article 9 (Mission Bay Districts) of the City Planning Code. Relevant City and County of San Francisco land use plans include, but are not limited to: the *San Francisco General Plan* (by Element), the *Central Waterfront Plan*, the *Northeastern Waterfront Plan*, the *Rincon Point-South Beach Redevelopment Plan*, and the existing *Mission Bay Plan*. Conformance of the project with the eight Priority Policies in Section 101.1 of the City Planning Code will be evaluated. The SEIR will also discuss the relationship of the project to, and compliance with, BCDC's *San Francisco Bay Plan* and *San Francisco Waterfront Special Area Plan* (which designates the Port Priority Use Area), the Port of San Francisco's *Conceptual Maritime Master Plan for the Southern Waterfront* and the *Waterfront Land Use Plan*, the Metropolitan Transportation Commission's (MTC) Transportation Improvement Program, and MTC's and BCDC's *San Francisco Bay Area Seaport Plan*.

The SEIR will: 1) describe the two proposed Redevelopment Plans and Design for Development documents for Mission Bay North and Mission Bay South; 2) describe proposed amendments to the *San Francisco General Plan* and changes to any other plans; 3) discuss how the proposed Redevelopment Plans, Design for Development documents, and amendments to other plans would change the land use policies associated with existing land use plans; and 4) evaluate compatibility of the project with existing (unmodified) policies.

B. ENVIRONMENTAL EFFECTS - Could the project:

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
1. <u>Land Use</u>				
*a. Disrupt or divide the physical arrangement of an established community?	___	<u>X</u>	<u>X</u>	___
b. Have any substantial impact upon the existing character of the vicinity?	<u>X</u>	___	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

As described in the Land Use, Business Activity, and Employment section of the 1990 FEIR,⁷ the Project Area is, for the most part, an underutilized industrial area occupied by interim use warehouses, truck yards, and other land-intensive uses; there is no established residential community. As project development proceeds, almost all existing buildings would be removed. The proposed project would constitute a dramatic change in the types and intensity of land use, introducing multi-family residential, hotel, retail, office, research and development, industrial, and commercial uses to the Project Area. It would include a new UCSF site.

The SEIR will discuss the compatibility of project land uses with nearby residential, commercial, industrial, and recreational uses, and effects that may result from the changes in land use and the related intensification of use of the Project Area. Build-out of the Project Area could encourage or change the nature of development in surrounding areas; these growth-inducing impacts will be analyzed in a separate section of the SEIR.

Mitigation measures will be included for any significant environmental impacts related to land use or growth inducement that are identified in the analysis.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
2. <u>Visual Quality</u>				
*a. Have a substantial, demonstrable negative aesthetic effect?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
b. Substantially degrade or obstruct any scenic view or vista now observed from public areas?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

7. 1990 FEIR, Volume Two, pp. VI.B.2 - VI.B.13.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
c. Generate obtrusive light or glare substantially impacting other properties?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

As discussed in the Architectural Resources and Urban Design section of the 1990 FEIR,⁸ the existing Project Area is largely vacant or occupied by low-rise structures. It is largely flat. The area is highly visible from Potrero Hill and I-280. The proposed project would change the visual character of the area, redeveloping the entire site. It would introduce buildings in some areas up to 160 feet in height, about 50 feet taller than any evaluated in the 1990 FEIR. Project buildings could obstruct existing views of the Bay or downtown San Francisco from areas surrounding and within the Project Area.

The SEIR will include an analysis with photographs of important visual features and views of the Project Area. The analysis will describe the change in visual character including height, bulk, and building scale of development associated with build-out of the proposed Redevelopment Plans. Photomontages will illustrate the change in visual character on public views to the Bay from Potrero Hill, I-280, and other locations.

The SEIR will also discuss the potential impacts from additional lighting from new building and parking structures constructed in the Project Area, and impacts on the project from night lighting at the approved San Francisco Giants ballpark, adjacent to the Project Area.

Mitigation measures will be included for any significant environmental impacts related to visual quality identified in the analysis.

8. 1990 FEIR, Volume Two, pp. VI.I.5-VI.I.17.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
3. <u>Population</u>				
*a. Induce substantial growth or concentration of population?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
*b. Displace a large number of people (involving either housing or employment)?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
c. Create a substantial demand for additional housing in San Francisco, or substantially reduce the housing supply?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

The 1990 FEIR described the types of employment in the Project Area in the mid-1980s; the most prevalent jobs were related to trucking and delivery.⁹ A land use and employment survey was conducted in June 1997, revealing that there are approximately 1,600 jobs currently in the Project Area.¹⁰ The majority of jobs are still related to trucking and warehousing operations.

Based on preliminary estimates, the project would accommodate approximately 11,000 new residents in 6,090 housing units, and 21,000 new jobs not related to the UCSF site, plus 9,100 UCSF employees (of which 8,100 would be net new jobs).¹¹ This would be an increase of 1.5% over San Francisco's existing resident population of 778,000, an increase of

9. 1990 FEIR, Volume Two, pp. VI.B.38-VI.B.40.

10. Hausrath Economics Group, Land Use Statistics for EIR Project Description, July 21, 1997.

11. a) Preliminary estimates, Hausrath Economics Group, Draft Table 5, Proposed Project, Memorandum from Sally Nielsen, Hausrath Economics Group, to William F. Dietrich, EIP Associates, August 7, 1997.

b) UCSF employment is from the *UCSF Long Range Development Plan Environmental Impact Report* (SCH No. 95123032), Impact 12N-2, p. 516.

1.8% over the current housing stock of 335,000 dwelling units, and an increase of 3.8% over current citywide employment of 548,000 jobs.¹² If all of this development were built and occupied by 2015, the Mission Bay Project Area would contain 1.3%, 1.7%, and 4.5% of San Francisco's total population, housing, and employment, respectively, projected for the year 2015.¹³

There are no existing residential units in the Project Area that would be displaced by the proposed project. Project-related development would gradually displace existing businesses and employees. If applicable, relocation assistance would be provided under the California State Redevelopment Law as contained in the California State Health and Safety Code, Section 33300 et seq.

The proposed project would also create construction employment for the construction labor market serving San Francisco.

For the purposes of project description and general information, the SEIR will assess the project's impact on population, housing, employment, and business activity, including the potential to induce growth outside the Project Area. The SEIR will discuss direct housing, resident employment (permanent and construction), and business activities that the proposed project would create, and their relationship to projected growth for San Francisco. This discussion will also describe new business opportunities and identify existing businesses in the Project Area that might be accommodated in the new development.

12. a) San Francisco's 1997 population and housing stock estimates are from the California State Department of Finance, Demographic Research Unit, Report E-5, May 1997 (estimates as of January 1, 1997).

b) The 1997 employment estimate was calculated based on a straight-line interpolation between projections for years 1995 and 2000 in the Association of Bay Area Governments, *Projections '96*, December 1995, p. 205.

13. Association of Bay Area Governments (ABAG), *Projections '96*, as modified by Keyser Marston Associates for the San Francisco Redevelopment Agency's *San Francisco Cumulative Growth Study*, August 27, 1997.

The SEIR will assess the implications of the proposed project for increased housing supply and housing demand in San Francisco. Indirect and induced population, housing, household, and employment growth stimulated by the proposed project and its relationship to projected growth for San Francisco will be analyzed. The SEIR will discuss changes in surrounding areas that might result in terms of future development patterns, housing market conditions, and levels of business activity and employment. Such "Nearby Areas" include Potrero Hill, Showplace Square/North Potrero Hill, Inner Mission, Central Bayfront/Bayview-Hunters Point, Port property east of the Project Area and in the Channel, Lower Potrero Hill, South of Market (including South Beach), and other parts of Downtown.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
4. <u>Transportation/Circulation</u>				
*a. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system?	<u>X</u>	<u>—</u>	<u>X</u>	<u>X</u>
b. Interfere with existing transportation systems, causing substantial alterations to circulation patterns or major traffic hazards?	<u>X</u>	<u>—</u>	<u>X</u>	<u>X</u>
c. Cause a substantial increase in transit demand which cannot be accommodated by existing or proposed transit capacity?	<u>X</u>	<u>—</u>	<u>X</u>	<u>X</u>
d. Cause a substantial increase in parking demand which cannot be accommodated by existing parking facilities?	<u>X</u>	<u>—</u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

The proposed development in the Project Area would increase traffic on local streets and freeways in and near the Project Area, as would the alternatives analyzed in the 1990 FEIR. However, the types and amounts of uses proposed are different from those analyzed in the 1990 FEIR, and new information about trip generation rates is available based on the Citywide Travel Behavior Survey conducted by the San Francisco Planning Department, the San Francisco Public Utilities Commission, and the County Transportation Authority in 1992. In addition, more recent growth forecasts have been prepared by the Association of Bay Area Governments and by city agencies that affect future cumulative transportation analyses. New streets and a new street pattern are proposed to be created in the Project Area, changing the circulation pattern compared both to the existing street pattern and to street patterns shown and analyzed in the 1990 FEIR. The project would also increase the demand for and use of regional and citywide transit services. The Third Street Light Rail Project, currently under consideration by the San Francisco Municipal Railway, is proposed to use streets in the Mission Bay Project Area on an alignment different from that assumed for an extended MUNI Metro in the 1990 FEIR. Based on these changes, a new transportation analysis will be provided in the SEIR to assess potential impacts caused by the proposed project.

The SEIR will include analysis and discussion of the project's potential traffic impacts in the afternoon (p.m.) peak hour on local intersections in the transportation study area and on regional freeways and at freeway entrances. The SEIR will assess effects on local and regional transit systems of planned development in the area. Traffic and transit analyses will be carried out for existing-plus-project conditions and for cumulative growth in the year 2015 including the proposed project, using the Metropolitan Transportation Commission (MTC) travel demand model. The MTC model will be adjusted to include a cumulative growth scenario established by the Planning Department and the Redevelopment Agency. This growth will account for population and employment increases in the region, the City, and in Nearby Areas, and will include new employment at the San Francisco Giants ballpark across Third Street from the Mission Bay North area. Travel from games and other events at the ballpark would not occur on a daily basis, unlike commute-related travel; in the Giants

Ballpark FEIR¹⁴ game and event travel was assumed to occur for the most part either before (for weekday afternoon games) or after (for weeknight games) the afternoon peak period. Therefore, game and event travel will be discussed in the SEIR but will not be included in the quantified cumulative transportation analysis for the Mission Bay project.

Existing parking conditions will be described for the Project Area. The SEIR will analyze parking demand in relation to general amounts of parking expected as part of the land use plans for Mission Bay North and Mission Bay South. The SEIR will also evaluate pedestrian and bicycle effects, and loading and delivery issues. Changes in rail freight access and general construction transportation issues will be discussed.

Mitigation measures will be included for any significant environmental impacts related to transportation identified in the analysis.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
5. <u>Noise</u>				
*a. Increase substantially the ambient noise levels for adjoining areas?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
b. Violate Title 24 Noise Insulation Standards, if applicable?	<u> </u>	<u>X</u>	<u>X</u>	<u> </u>
c. Be substantially impacted by existing noise levels?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

14. City and County of San Francisco, Planning Department, *San Francisco Giants Ballpark at China Basin Channel Final EIR*, State Clearinghouse No. 96102056, Planning Department File No. 96.176E, certified June 26, 1997.

The proposed project would cause an increase in traffic volumes in and near the Project Area, with a concomitant increase in ambient noise levels near streets carrying more cars. The 1990 FEIR described existing noise levels and analyzed potential increases due to increases in traffic volumes on local streets in and near Mission Bay.¹⁵ Proposed street and circulation patterns are different from those analyzed in the 1990 FEIR. Traffic volumes and associated noise effects will be recalculated for the SEIR. The proposed project includes new land uses, such as a UCSF site, and does not relocate the Caltrain terminal, which would be adjacent to proposed housing. Therefore, the effects of noise sources on sensitive receptors will be reevaluated in the SEIR.

In addition to the evaluation of potential noise sources and impacts that would be created by the project, existing and future noise sources in the Project Area will be evaluated for potential impacts on the proposed project's new sensitive receptors. These noise sources include: Caltrain trains; the proposed MUNI Metro Third Street Light Rail Project (now planned for Third and Fourth Streets in the Mission Bay Project Area, rather than King Street to Seventh Street as analyzed in the 1990 FEIR); crowd and concert noise from the approved San Francisco Giants ballpark; and the drawbridges across China Basin Channel. Proposed sensitive receptors include a school, UCSF classrooms, and a church.

Mitigation measures will be included for any significant environmental impacts identified in the analysis.

Other noise topics were adequately covered in the 1990 FEIR, as summarized below.

Title 24 Noise Requirements

The project's housing would be subject to the noise insulation requirements of Title 24 of the California Code of Regulations. Therefore, noise insulation would be provided in those

15. 1990 FEIR, Volume Two, pp. VI.G.1 - VI.G.27.

buildings, and no violations of Title 24 are expected. The SEIR will not contain further discussion on this topic.

Building Mechanical Noise

The proposed project would include research and development (R&D) and other light industrial uses which could produce operational noise from building mechanical equipment. These operations are subject to the City Noise Ordinance, Article 29 of the San Francisco Police Code. Compliance with Article 29, Section 2909, would minimize any noise increases from these operations. Although the University of California is not subject to the City's local Noise Ordinance, UCSF's site would be developed under the same standards as outlined in Article 29. To minimize building mechanical noise and other operational noise, the UCSF LRDP FEIR provides under Mitigation Measure 12.E.1-2, that operational noise from UCSF sources will not exceed noise levels set forth in local ordinances for adjacent areas based on their use. Based on this agreement, UCSF would comply with the City Noise Ordinance and therefore would not have a significant impact from building mechanical noise or operation noise. Therefore, the noise generated by mechanical equipment on buildings in the Project Area will not be discussed further in the SEIR.

Construction Noise

Construction activities from the project would potentially include: pile driving, excavation and hauling, erection, and finishing. Construction activities would be temporary and intermittent in any given area and would occur at different times in different portions of the Project Area. No phasing plan is proposed at this time. Noise from construction activities is expected to be similar to the impacts addressed in the 1990 FEIR, pp. VI.G.11 - VI.G.16; no major new information about construction noise has come to light since that FEIR was certified. As explained in the 1990 FEIR, pile-driving noise could be heard as far away as Rincon Hill to the north, Howard Street to the northwest, US 101 to the west, and about 23rd Street to the south. Beyond those areas, pile driving would not be heard above

background noise. The repetitive nature of the noise and the accompanying vibrations from this activity would be disruptive and annoying to residents. During pile driving, indoor noise levels in residential buildings in the Mission Bay Project Area and immediately adjacent residential areas would probably reach 64 dBA L_{eq} ¹⁶ with the windows closed and 89 dBA L_{eq} with the windows open, which could interfere with conversation. Such intrusive events would be annoying and would disrupt normal daytime activities for receptors within 100 feet of the pile driver, if indoors with windows open, and up to 800 feet away if outdoors.

During pile driving, houseboat residents and pleasure craft users of the Channel could be exposed to outdoor noise levels up to 93 dBA L_{eq} . Noise levels within these boats would probably exceed 73 dBA L_{eq} due to their relatively light construction. Noise levels of that magnitude would be annoying and may produce physiological effects, such as change in motor coordination, if exposure occurs for extended periods. In addition, houseboat residents and pleasure craft users of the Channel would be exposed to outdoor noise levels up to 77 dBA L_{eq} from excavation and finishing phases of construction activities. This estimate is based on the assumption that construction would be underway about 200 feet from housing, with no intervening obstructions. Interior noise levels could reach 67 dBA L_{eq} with open windows. Noise levels this high would make conversation difficult.

There are three basic approaches to reducing noise impacts: reduce the sound level at the source, provide the receiver with shielding, and alter the path of sound transmission. The 1990 FEIR discussed several means of reducing construction noise. While these methods were discussed under the mitigation section of the 1990 FEIR,¹⁷ the measures included there

16. Definitions: dB: Decibel is a logarithmic unit used to describe sound energy intensity.

dBA: "A-weighted" Decibel is the most commonly used environmental noise measurement. A-weighted decibel measurements de-emphasize the very low and very high frequency components of sound, similar to the responses of the human ear.

L_{eq} : The Equivalent Energy Level associated with sound energy measured over a period of time.

17. 1990 FEIR, Volume Two, Measures G.1 and G.2, pp. VI.G.30 and VI.G.31.

describe means of complying with the San Francisco Noise Ordinance (Article 29, San Francisco Police Code). Compliance with the Noise Ordinance is required by law and would reduce any significant impacts to a less than significant level.

Construction activities would be expected to occur in the Mission Bay Project Area for many years, during which some residential buildings would be completed and occupied. New residents would experience similar effects to those described in the 1990 FEIR due to construction noise. Table VI.G.3 in the 1990 FEIR (p. VI.G.12) provides representative examples of typical construction noise from the groups of construction equipment generally in use during various stages of construction, and the distances from the construction site to reduce noise to ambient levels. Concurrent construction activities at more than one location would either increase the overall noise levels by about 3 dBA if the construction sites were very close to one another, or would expand the area affected by construction noise if the sites were widely separated in the Project Area. Construction at sites near the Project Area, such as for the Giants ballpark across Third Street from Mission Bay North, occurring concurrently with construction at sites within the Project Area would temporarily increase the overall noise levels in the immediate vicinity of construction activities, as the noise intensity would be greater with a larger number of noise sources.

Based on the above analysis and information from the 1990 FEIR, no further discussion of construction noise will be presented in the SEIR.

Other Noise Sources

Noise from crowds attending baseball games or events at Pacific Bell Park has been fully analyzed in the Giants Ballpark FEIR.¹⁸ Two sites within the Mission Bay Project Area were analyzed in the Giants Ballpark FEIR, one just west of Third Street at Townsend Street

18. City and County of San Francisco, Planning Department, *San Francisco Giants Ballpark at China Basin FEIR*, SCH No. 96102056, file no. 96.176E, certified June 26, 1997, pp. IV.239 - IV.242 and IV.251 - IV.256.

(adjacent to the existing recreational vehicle park), and another on Berry Street between Third and Fourth Streets. At most residential locations near the ballpark, including the two sites within the Project Area, average hourly noise levels from crowds at the ballpark would not exceed existing ambient noise levels from traffic and other urban sources, although crowd noise would be noticed by listeners in upper-story apartments near the ballpark and in outdoor areas, because the sound has a different quality than traffic noise. At upper-story apartments across from and facing the ballpark (at about 100 to 130 feet above street level) crowd noise would noticeably increase average hourly noise levels, by about 3 to 4 decibels above existing levels. Some listeners could find cheering noises and crowd noise annoying; others might enjoy hearing crowds and occasional cheers from the ballpark. Crowds leaving the ballpark after night games (generally around 10:30 - 11:00 p.m.) would also be a source of noise for those in lower-level apartments facing streets leading to parking lots and garages and leading to local transit stops. The Giants Ballpark FEIR concludes that because of the limited increase in noise levels due to crowd noise, the limited duration and frequency of ball game and other large-crowd events at the ballpark, and because of the urban setting of the ballpark, crowd noise would not be considered a significant impact. Based on this conclusion, and because the Giants Ballpark FEIR analyzed crowd noise effects on sites in the Mission Bay Project Area closest to the ballpark site, no further analysis of this topic is necessary in the Mission Bay SEIR.

As noted in the Giants Ballpark FEIR, concerts would be distinctly noticeable in nearby parks, including South Beach Park adjacent to the east of the ballpark, and might discourage some users, but could attract others interested in listening to the music.¹⁹ The project's proposed open space on the south edge of China Basin Channel between Third and Fourth Streets is expected to experience similar concert noise levels, and could attract some interested in hearing a concert while others may be discouraged from using the open space during concerts. The houseboat docking area would be shielded from ballpark concert noise

19. City and County of San Francisco, Planning Department, *San Francisco Giants Ballpark at China Basin FEIR*, SCH No. 96102056, file no. 96.176E, certified June 26, 1997, p. 259.

by the China Basin Landing Buildings.²⁰ The proposed open space adjacent to the houseboat area, along the south edge of the Channel west of Fourth Street, would also be shielded by these buildings; while concert noise from the amplified music would be noticeable because it is different from the usual urban background noise, it would not cause substantial increases over ambient noise levels at this location. Open space in the Mission Bay Project Area at greater distances from the ballpark would experience lower levels of concert noise. Based on this information, ballpark crowd noise effects on proposed new open space in the Mission Bay Project Area will not require further analysis in the SEIR.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
6. <u>Air Quality/Climate</u>				
*a. Violate any ambient air quality standard or contribute substantially to an existing or projected air quality violation?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
*b. Expose sensitive receptors to substantial pollutant concentrations?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
c. Permeate its vicinity with objectionable odors?	<u>X</u>	<u> </u>	<u> </u>	<u>X</u>
d. Alter wind, moisture or temperature (including sun shading effects) so as to substantially affect public areas, or change the climate either in the community or region?	<u>X</u>	<u> </u>	<u>X</u>	<u> </u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

20. City and County of San Francisco, Planning Department, *San Francisco Giants Ballpark at China Basin Summary of Comments and Responses*, SCH No. 96102056, file no. 96.176E, certified June 26, 1997, p. C&R.533.

Air Quality

During construction, air quality would potentially be affected by two forms of emissions related to construction: fugitive dust emissions, and heavy equipment emissions from the combustion of diesel fuel. The combustion of diesel produces emissions of nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), hydrocarbons (HC), and particulate matter with a diameter of less than 10 microns (PM_{10}). The primary pollutant of concern is the component of fugitive dust which is PM_{10} . The impacts of fugitive dust emissions will be assessed in the SEIR and addressed in terms of effective control measures.

Potential air quality impacts from the proposed project could occur due to increased traffic. Emissions will be calculated and compared to the Bay Area Air Quality Management District's (BAAQMD) significance thresholds for regional impacts. Of particular concern are carbon monoxide emissions and the possibility of exceeding carbon monoxide standards at congested intersections and nearby sensitive receptors. The impact of vehicular carbon monoxide emissions on local ambient levels will be assessed in the SEIR. Carbon monoxide concentrations will be estimated for existing, future-without-project, and future-with-project conditions. The results of the analysis will be compared to state and federal ambient air quality standards to evaluate impacts.

Three aspects of the project could produce emissions of toxic air contaminants (TACs): 1) excavation and aeration of contaminated soils, 2) UCSF laboratory and teaching activities, and 3) research and development (R&D) and light manufacturing operations. First, excavation and aeration of contaminated soils may release volatile compounds. Second, the TAC emissions associated with the UCSF laboratory and teaching will be addressed qualitatively in the SEIR based on data from the 1989 Radian Corporation study of toxic air contaminants at the UCSF Parnassus Heights campus and other studies. Third, the R&D and light manufacturing facilities proposed for the site have potential TAC emissions. These emissions will be assessed and discussed qualitatively in terms of human health risk in the SEIR.

The research and development and light manufacturing uses would potentially cause some objectionable odors due to the wide variety of chemicals and products that would be used in the daily operations. In addition to the potential odors from the research and development and light manufacturing, the Channel Street Pump Station would potentially expose future residents to objectionable odors. These odor emissions would be regulated by the BAAQMD. The effect of these odors on new residences and residences in the surrounding area will be evaluated and qualitatively discussed in the SEIR.

Shadows

The 1990 FEIR evaluated shadow effects and found that buildings in Mission Bay would not shade public parks outside the Project Area under the jurisdiction of the San Francisco Recreation and Park Department. Project buildings would shade open space proposed within Mission Bay, to varying degrees. Because the now proposed Mission Bay project would allow, at some locations, taller buildings than were evaluated in the 1990 FEIR, different shadow effects could occur.

The Sunlight Ordinance, Section 295 of the City Planning Code, was adopted in response to Proposition K (passed November 1984) to protect certain public open spaces from shadowing by new structures during the period between one hour after sunrise and one hour before sunset, year round. Section 295 restricts new shadow upon public spaces under the jurisdiction of the Recreation and Park Department by any structure exceeding 40 feet unless the City Planning Commission, in consultation with the Recreation and Park Commission, finds the impact to be insignificant. However, development in Mission Bay under a Redevelopment Plan would not be formally be subject to Section 295.

The closest open space areas in the project vicinity that are under the jurisdiction of the San Francisco Recreation and Park Department are South Park and Jackson Playground. South Park is in the center of the block bounded by Second, Third, Bryant and Brannan Streets, and is about 1,000 feet northeast of the Third and Townsend corner of the Project Area.

Jackson Park Playground is bounded by 17th Street on the north, Arkansas Street on the east, Carolina Street on the west, and Mariposa Street on the south and is located about one-half mile southwest of the Project Area. Two other public parks near Mission Bay, South Beach Park at The Embarcadero near King Street and Agua Vista Park, on the waterfront on Terry A. Francois Boulevard north of Mariposa Street, are under the jurisdiction of the San Francisco Redevelopment Agency and Port of San Francisco, respectively.

The extent and duration of shadows cast by buildings developed in Mission Bay would depend on the actual design, bulk, height, lot placement, and coverage of each individual structure. A shadow analysis was performed to generally evaluate whether any new buildings in Mission Bay could potentially shade any public open space under the jurisdiction of the San Francisco Recreation and Park Department. Generalized building massing for each land use and the maximum proposed height zones were used to estimate the maximum shading potential. The analysis consisted of a range of shadow scenarios throughout the year. The analysis illustrates the range of shadow effects throughout the day, from one hour after sunrise to about one hour before sunset (the time periods covered by Section 295). The shortest shadows occur in June and the longest in December.²¹

Based on the shadow analysis performed for this Initial Study, Mission Bay buildings would not shade any open space areas under the jurisdiction of the San Francisco Recreation and Park Department at any time. Thus, there would be no significant shadow impacts resulting from the project.

Mission Bay buildings would not shade South Beach Park, an existing open space under SFRA jurisdiction. Agua Vista Park, a one-half-acre waterfront park on Terry A. Francois Boulevard south of Pier 64, under Port of San Francisco jurisdiction, would be shaded in late spring and early summer at approximately one hour before sunset. Mission Bay buildings would shade open space areas proposed within the Project Area. There are seven main open

21. The shadow study is available for public review at the Planning Department, 1660 Mission Street.

space areas proposed as part of the Mission Bay project. Figure 2 shows the location of the larger proposed open space areas. The largest open space areas would be near the waterfront of the Bay on the eastern boundary of the Project Area, along the south edge of China Basin Channel, and along the "Mission Bay Mall". The mall is a proposed pedestrian-oriented open space, flanked by roadways, that would extend from the Owens Street roundabout to Terry A. Francois Boulevard.

The longest shadows occur during December. On December 21st at 10 a.m., shadows could affect open space at the north and south sides of China Basin and open space on the mall area. During midday, shadows could affect the open space on the south side of the China Basin Channel, the Mission Bay Mall, and a small portion of the Channel. At approximately 3:45 p.m., about one hour before sunset, most of the mall open space area would be shaded and the "waterfall open space area" would be partially shaded.

In June, the shortest shadow periods occur. Potential shadow effects are limited to mid-morning to mid-afternoon periods. During this time period, shadows generally would not affect China Basin Channel, the Mission Bay Mall, or waterfront open space areas. However, during the late afternoon period at about 5 p.m., shadows could cover open space areas on the north side of China Basin Channel and part of the waterfront open space.

The shadow effects on open space areas within Mission Bay would not be considered significant since the open spaces are not within the jurisdiction of the San Francisco Recreation and Park Department. The Redevelopment Agency documents would require the study of shadow effects of new development on existing and proposed open space areas.

Shading of China Basin Channel would not significantly affect vegetation or wildlife in or near the Channel. Existing salt marsh vegetation is dormant during the winter when shading effects are greatest. Wildlife would not be expected to be affected by shading in the Channel.

Wind

In order to provide a comfortable wind environment for people in San Francisco, the City established specific comfort criteria to be used in the evaluation of proposed buildings in certain areas of the City. The City Planning Code specifically outlines these criteria for the Downtown Commercial (C-3) District and each of the Rincon Hill, Van Ness Avenue, and South of Market areas [Sections 148, 249.1(a)(3), 243(c)(8), 263.11(c)]. There are no specific wind comfort or wind hazard criteria in the City Planning Code that would apply to Mission Bay. The 1990 FEIR evaluated wind effects, and concluded that proposed buildings 100 feet or higher could generate pedestrian-level wind effects. The FEIR concluded that buildings up to 110 feet would not be expected to generate hazardous winds, defined in City Planning Code Section 148 as an hourly average of 26 mph for more than any single hour of the year.

Large structures can affect street-level wind conditions. Wind conditions partly determine pedestrian comfort on sidewalks and in other public areas. In developed areas, buildings typically about 100 feet or more in height can redirect wind flows around buildings and divert winds downward to street level, which can result in increased wind speed and turbulence at street level. However, possible increases in wind speed depends on the heights, configurations, and orientations of surrounding buildings and streets.

Prevailing winds in and near the downtown area, including Mission Bay, are from the northwest, west-northwest, west, and west-southwest. The extent and magnitude of wind effects of new buildings in Mission Bay would depend on the actual design, height, bulk and placement of each specific structure in relationship to adjacent buildings, streets and open space areas. Proposed height zones for the Mission Bay project range from 65 feet to 160 feet. The Design for Development proposes a 75% lot coverage limit above a 25-foot height, but does not require setbacks at that height. Since further building design characteristics have not yet been determined at this stage in project development, wind studies cannot be conducted for any building exceeding the 100 ft. level analyzed in the 1990 FEIR.

Mitigation Measures

The following mitigation measure is required to ensure that any potentially significant wind effects resulting from the project are identified, evaluated and mitigated. While the standards of City Planning Code Section 148 do not apply to the project, its standards provide an appropriate methodology and criterion for the analysis of wind effects.

As discussed in the 1990 FEIR, Mitigation Measure I.10, on p. VI.I.74, the developer shall be required to retain a qualified wind consultant to review specific designs for buildings 100 feet or more in height for potential wind effects. The evaluation would focus on the potential for generation of hazardous wind and would evaluate the need for windbreak features or further detailed wind-tunnel studies of the proposed structures. The results of this review would provide a basis for design modifications prior to construction to eliminate exceedances of the hazard criterion.

UCSF would also agree to prepare a wind analysis for buildings over 100 feet, and would incorporate design features as necessary to eliminate hazardous wind criteria exceedances.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
7. <u>Utilities/Public Services</u>				
*a. Breach published national, state or local standards relating to solid waste or litter control?	<u> </u>	<u> X </u>	<u> X </u>	<u> </u>
*b. Extend a sewer trunk line with capacity to serve new development?	<u> X </u>	<u> </u>	<u> X </u>	<u> X </u>
c. Substantially increase demand for schools, recreation or other public facilities?	<u> X </u>	<u> </u>	<u> X </u>	<u> X </u>

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
d. Require major expansion of power, water, or communications facilities?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

Overview

The 1990 FEIR analyzed community services and utilities, including fire protection, police protection, schools, recreation and parks, libraries, public health, water supply, sewers and wastewater treatment, solid waste, and streets. It was found that Alternatives A and B would result in the need for additional fire and police personnel, equipment, and building space; would require new schools; and would not meet demand created by residents and employees for open space.²² In addition, measures were included to address public health, water supply, sewerage, and solid waste concerns, even though no significant impacts were expected in these areas.²³

The currently proposed project has fewer planned dwelling units and more projected employees than were evaluated in the 1990 FEIR. The proposed project is closest in size to Alternative A, with about 6,000 planned dwelling units and about 30,000 projected employees for the proposed project, compared to 7,700 planned dwelling units and 25,000 projected employees for Alternative A.^{24,25} Therefore, the proposed project would be

22. 1990 FEIR, Volume One, p. II.37.

23. 1990 FEIR, Volume One, p. II.41.

24. Preliminary estimates, Hausrath Economics Group, Draft Table, Proposed Project, July 16, 1997. UCSF employment estimate from *UCSF Long Range Development Plan Environmental Impact Report* (SCH No. 95123032), Impact 12N-2, p. 516.

25. 1990 FEIR, Volume One, pp. II.7, II.18.

expected to add to the demand for community services and utilities to a similar extent as estimated for Alternative A in the 1990 FEIR.

Since the 1990 FEIR, providers of various services have made changes in the way community services are provided and built or have changed facilities. These changes will be discussed where applicable in the SEIR. Also, aspects of the project that would accommodate the provision of community services and utilities will be analyzed. In addition, proposed infrastructure that is part of the project will be analyzed.

As discussed in the 1990 FEIR, development of the Mission Bay Project Area would add to demand for some community services and utilities, and may necessitate the construction of new facilities, the impact of which will be discussed in the applicable section of the SEIR. In other cases, impacts would be primarily social and economic, and therefore are not considered environmental impacts subject to the provisions of CEQA.²⁶

Community Services and Utilities in SEIR

Community services and utilities that will be discussed in more detail in the SEIR, as their provision may result in environmental impacts, include fire protection, police protection, public health services, recreation and parks, schools, solid waste disposal, water supply, sewers and wastewater treatment, power supply, and telecommunications.

Fire and police protection will be discussed in the SEIR in terms of current resources, demand generated by the proposed project, and the resulting impact on each department's ability to provide services.

26. See Goleta Union School District v. The Regents of the University of California, 36 Cal. App. 4th 1121 (1995).

Public health services will be analyzed taking into account Department of Public Health reorganization that has occurred since the study was done for the 1990 FEIR. The current level of demand, impact of the proposed project, and facilities available to meet that demand will be discussed.

Recreation and parks will be discussed with respect to existing open space in the surrounding area, impact of the proposed project on the amount and type of open space available, and whether the proposed open space meets resident and employee demand for recreation and parks.

The existing capacity in nearby schools, demand generated by the proposed project, and subsequent impact on the San Francisco Unified School District will be analyzed in the SEIR. This analysis will be done taking into account changes in school enrollment and district enrollment projections, the impact of new laws limiting class size for Kindergarten through third grade on the District's ability to accommodate new students, and changes in the availability of surplus space in schools and classrooms for new students. A school site is proposed as part of the project.

Solid waste generation and disposal will be discussed in the SEIR. Projections for total solid waste generation will be analyzed for the proposed project. These demands will be compared to the 1990 FEIR's analysis taking into account the effects of San Francisco's Source Reduction and Recycling Element.

The SEIR will discuss water supply in terms of demand generated by the proposed project. Current and planned infrastructure for low-pressure, high-pressure, and reclaimed water systems will be described.

The impact of the proposed project on sewers and wastewater treatment capacity will be discussed in the SEIR. The proposed project includes two options for collection systems that would separate stormwater and sanitary sewer flows, which will be discussed. Average dry

weather flow and average wet weather flow will be examined. The potential for increases in system wet weather overflows due to the project will be discussed.

The Community Services and Utilities section of the SEIR will include an analysis of power supply for the proposed Project Area, including whether additional major gas distribution lines, electric transmission lines, a new substation, or major substation improvements would be needed to accommodate demand generated by the proposed project.

The SEIR will include a description of how telecommunications services would be provided to new development in Mission Bay and whether demand would necessitate any major new facilities, such as a switching station.

Mitigation measures will be included for any significant environmental impacts related to public services identified in the analysis.

Child Care

In the 1990 FEIR, child care was discussed for informational purposes only.²⁷ It was determined that there would be an increase in the need for child care services due to the projected increases in student and pre-school population combined with increasing numbers of working parents.²⁸ The 1990 FEIR discussed the San Francisco requirement in Section 314 of the City Planning Code, legislated as part of the adoption of the *Downtown Plan*, which requires the provision of child care facilities or payment of an in-lieu fee for office and hotel development projects in the C-3 Districts north of Mission Bay.²⁹ This is not applicable to the proposed project because such requirements do not apply in Redevelopment Areas. While there would be an increase in demand for child care services due to the

27. 1990 FEIR, Volume Two, p. VI.D.51a.

28. 1990 FEIR, Volume Two, p. VI.D.51a.

29. 1990 FEIR, Volume Two, p. VI.D.51a.

addition of new households, some of which would include families, this would not be considered an environmental impact subject to the provisions of CEQA, because the need for such services is a socioeconomic issue.³⁰

Emergency Medical Service

In the 1990 FEIR, emergency medical service was described as part of Public Health Services, as it was provided by the San Francisco Department of Public Health. In 1997, emergency ambulance service was shifted to the San Francisco Fire Department. The Mission Bay Project Area remains in Zone 6 and would be served both by the paramedic ambulance at Fire Station 1 at Third and Howard Streets or Fire Station 17 at 1295 Shafter Avenue, and by Fire Department emergency medical technician firefighters from Station 8 at 36 Bluxome Street or Station 25 at Third Street and Cargo Way.³¹ The City's ambulance fleet has increased from 14 to 26 vehicles since 1986, when information was obtained for the 1990 FEIR. Development in the Mission Bay area would increase the number of calls for ambulance service, as indicated in the 1990 FEIR. Service demand could increase the number of paramedics needed to provide for this additional development. As explained for Child Care Services, above, increased demand for ambulance service and the need to provide increased staffing for the Fire Department's ambulance fleet is a socioeconomic issue in that it would require the expenditure of additional City funds but would not require construction of additional physical facilities, and therefore would not be considered an environmental impact subject to CEQA review.

30. The State Court of Appeal decision published for San Franciscans for Reasonable Growth et al. v. City and County of San Francisco [209 Cal. App. 1502, 1516 (1989)] upheld the City's determination that child care issues are not a physical environmental impact that require analysis in CEQA documents.

31. Captain Russ McCallion, Section Chief, San Francisco Fire Department, Division of Emergency Medical Services, written communication to EIP Associates, August 8, 1997.

Libraries

The 1990 FEIR discussed impacts on library services in terms of demand generated by the various alternatives under consideration and available library resources to meet that demand. The nearest branch library to the proposed project site is the Potrero Branch Library. The 1990 FEIR determined that this branch along with the Main Library would be sufficient at that time to provide for any increase in demand generated by the project.³²

The proposed project would generate less demand than Alternatives A and B discussed in the 1990 FEIR, due to fewer planned dwelling units. Also, at the time the 1990 FEIR was prepared, the San Francisco Library's plan was to consolidate neighborhood services into larger and fewer branches. There are now more library resources than in 1990 due to the passage of Proposition E in June 1994, and the completion of the new Main Library. Proposition E requires the City to maintain funding for the Library Department at a level no lower than that for the 1992-93 fiscal year, and to keep open a main library and 26 branch libraries for a minimum number of hours each week. Since demand from the proposed project would be less than that assessed for the earlier project, and since resources are greater now than anticipated in the 1990 FEIR, existing facilities would be sufficient to meet the demand of the proposed project. Therefore, the proposed project would not need additional library facilities, and libraries will not be analyzed further in the SEIR.

Streets and Street Maintenance

As discussed in the 1990 FEIR, development of the Mission Bay Project Area would include the construction of new streets and improvements to existing streets within the Project Area.³³ The average expected life-span of new streets to be constructed as part of the proposed project would be about 20 years after which rehabilitation (either resurfacing or full

32. 1990 FEIR, Volume Two, p. VI.D.92.

33. 1990 FEIR, Volume Two, pp. VI.D.112 - VI.D.113.

reconstruction) would be needed.³⁴ Construction and improvements would be completed in accordance with required standards applicable throughout the City. Once completed to standards acceptable to the City, public streets would be dedicated to the City, and the City would then become responsible for ongoing maintenance of the streets and street improvements, as is the case for most streets in the City.³⁵ Potential effects on services resulting from new streets and improvements to existing streets will not be discussed further in the SEIR.

The 1990 FEIR addresses the increased use of off-site streets surrounding the Project Area and the potential for increased, unusual, accelerated deterioration and associated maintenance.³⁶ In particular, truck traffic during construction is mentioned as a possible cause of increased need for street maintenance of off-site streets. The 1990 FEIR suggests analysis of these streets would be required to determine the need for street reconstruction in support of the project.³⁷ No mitigation measure was suggested, and no further analysis is needed. The issue of off-site street maintenance will not be discussed in the SEIR.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
8. <u>Biology</u>				
*a. Substantially affect a rare or endangered species of animal or plant, or the habitat of the species?	<u> </u>	<u> X </u>	<u> X </u>	<u> X </u>

34. Fred W. DeJarlais, Vice President, KCA Engineers, Inc., telephone conversation, July 15, 1997.

35. Certain larger streets in the Project Area would include land dedicated to driveway access for parking and loading areas, to utility corridors, and to view corridors. These areas will be called "private streets" in the SEIR, and may include private landscaped or paved areas.

36. 1990 FEIR, Volume Two, p. VI.D.113.

37. 1990 FEIR, Volume Two, p. VI.D.113.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
*b. Substantially diminish habitat for fish, wildlife or plants, or interfere substantially with the movement of any resident or migratory fish or wildlife species?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
c. Require removal of substantial numbers of mature, scenic trees?	<u> </u>	<u>X</u>	<u> </u>	<u> </u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

Historically, the land underlying the Mission Bay Project Area was a shallow, salt marsh-dominated, wide-mouthed embayment covering approximately 260 acres of San Francisco Bay. The present-day Channel, encompassing approximately 12 acres, is the last remnant of the original Mission Bay. It is an un-lined, degraded waterway approximately 200 feet wide and 3,400 feet long, with concrete rubber rip-rap and earthen banks. The Mission Bay Project Area includes approximately 6,200 linear feet of Channel edge.

Aquatic Habitats and Water-Dependent Wildlife

Aquatic habitats and associated wildlife in the China Basin Channel include open water habitat, supporting fish, and bottom muds, supporting benthic invertebrates. A narrow fringe of pickleweed (an indicator of northern salt marsh wetland habitat) occurs along the Channel. All of these habitats support waterbirds.

The water-dependent species (invertebrates, fish, birds, and marine mammals) present in the Channel are common to the margins of San Francisco and San Pablo Bays. They will be described in more detail (based on benthic sampling, fish trawling, and bird surveys performed in 1997) in the Vegetation and Wildlife Section of the SEIR. The SEIR analysis will focus on potential impacts on aquatic species and habitats. These impacts include loss of

wetland habitat (which will be quantified by square footage), increased human activity, and water quality effects.

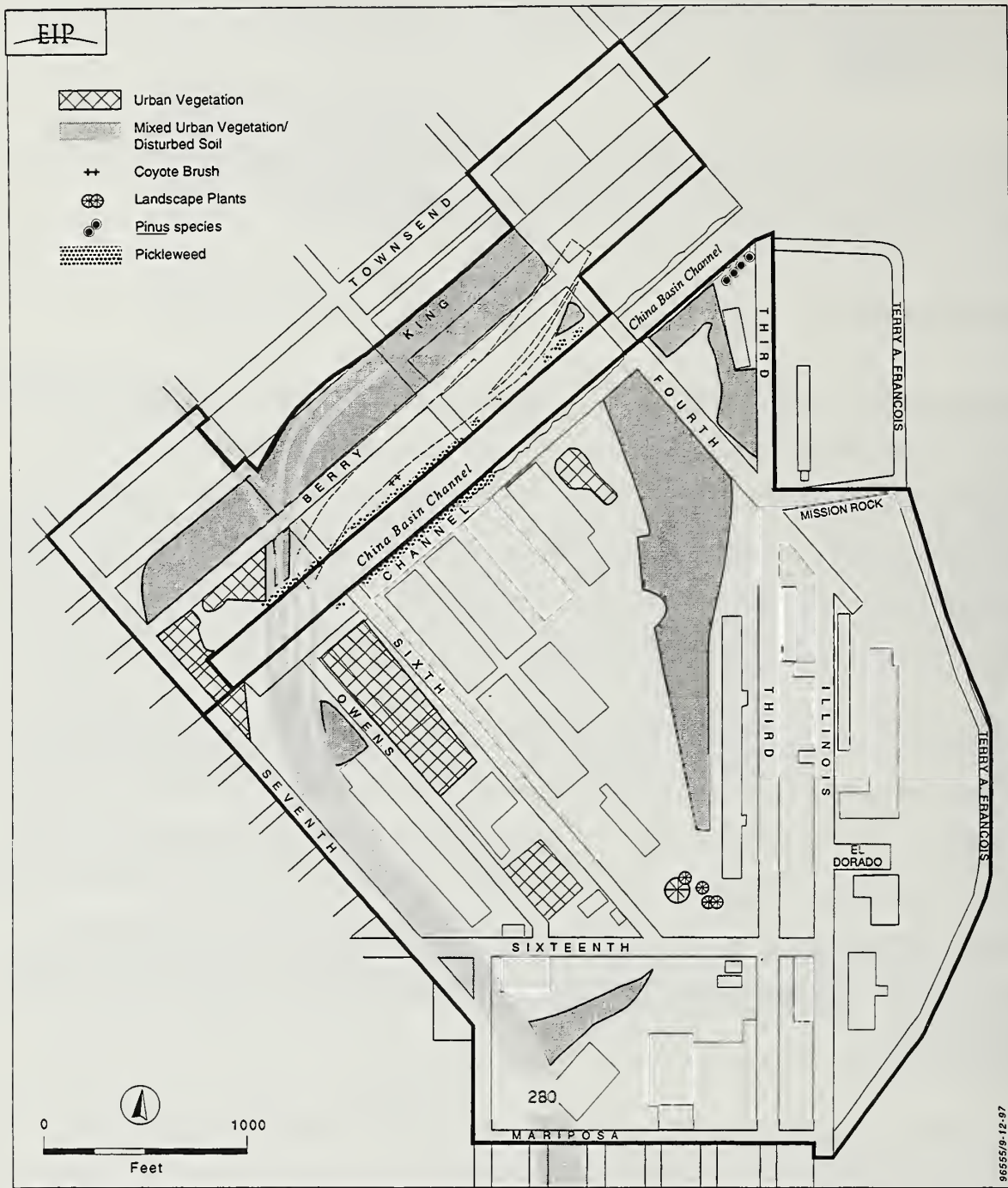
Mitigation measures will be included for any significant environmental impacts related to natural resources of China Basin Channel identified in the analysis.

Upland Vegetation

There is no native upland vegetation in the Project Area (see Figure 4). On the south shore near the middle reach of China Basin Channel, non-native iceplant (*Carpobrotus* sp.) is encroaching on the narrow strip of salt marsh vegetation which fringes the Channel. The upper Channel banks are vegetated with ruderal (weedy) non-native annual grasses and forbs, including slender wild oat (*Avena barbata*), sweet fennel (*Foeniculum vulgare*), bristly ox-tongue (*Picris echioides*), prickly lettuce (*Lactuca serriola*), and horseweed (*Conyza* sp.).

The upland or landward portion of Mission Bay North is heavily disturbed and supports virtually no vegetation. The ruderal vegetation occurring in Mission Bay North is similar to that observed in Mission Bay South. The upland portion of Mission Bay South is mostly disturbed and sparsely vegetated. Non-native upland annual grasses and forbs include slender wild oat, sweet fennel, bristly ox-tongue, horseweed and rough cat's-ear (*Hypochaeris radicata*). These ruderal species are commonly found in disturbed urban areas throughout the Bay Area.

Ornamental plantings occur along the Channel around the Channel Street Pump Station at the west end of the Channel, at the houseboat community on the south side of the Channel, and along the boardwalk of the China Basin Building between Third and Fourth Streets. None of these plantings includes mature heritage or specimen trees. Landscape trees occurring on the south portion of Mission Bay South include cypress (*Cupressus* sp.), pine (*Pinus* sp.), and acacia (*Acacia* sp.). In the vicinity of the Mission Creek Marina, Friends of the Urban



SOURCE: EIP Associates

MISSION BAY SEIR INITIAL STUDY
FIGURE 4 EXISTING HABITATS

Forest have planted trees, and a community garden has been established on the south bank of the Channel. No substantial numbers of mature, scenic trees occur in the Project Area.

No federal- or state-listed threatened, endangered, or rare plant species are known to occur in the proposed Project Area.^{38,39} No sensitive plant species would be expected to occur because of its long history of disturbance and human occupation; none were observed on the Project Area in surveys conducted for the 1990 FEIR,⁴⁰ none were observed during field surveys conducted by EIP Associates, Inc. in June 1994 for the proposed UCSF LRDP-Mission Bay Site FEIR,⁴¹ and none were observed during surveys conducted by EIP Associates over five days in June 1997 for this Initial Study.

There is no potentially significant vegetation in the upland areas of Mission Bay. This issue will not be discussed further in the SEIR.

Wildlife in Upland Areas

The urban nature of the Project Area and lack of terrestrial vegetation for food and cover severely limit the value of the upland portions of the Project Area to wildlife. Upland ruderal and ornamental vegetation in Mission Bay South provides limited low-quality foraging habitat for seed- and insect-eating land birds, small- to medium-sized rodents, and raptors, which may prey upon the rodents and smaller birds. Less than one-third (31%) of the bird species observed in the Mission Bay Project Area are primarily upland species. Non-native plants are of less forage value to native bird species because native species of

38. California Department of Fish and Game - Natural Diversity Data Base, Sacramento, California. Data for the San Francisco North quadrangle purchased March 18, 1997.

39. 1990 FEIR, Volume Two, pp. VI.M.1 - VI.M.3.

40. 1990 FEIR Volume Two, p. VI.M.1.

41. University of California, San Francisco, *UCSF Long Range Development Plan Environmental Impact Report*, SCH No. 95123032, January 1997.

animals are most efficiently adapted through evolution to utilize native plant species. The scarcity of trees and shrubs of substantial size in the Project Area limits perching and nesting sites for landbirds. During summer bird surveys conducted by EIP Associates in June 1997, three songbird nests were observed in landscape trees planted adjacent to the upper third of the south bank of the Channel, and a nest of a hooded oriole was observed in a palm tree on the north side of the Channel between Third and Fourth Streets.

Black-tailed jackrabbits were reported to occur on a portion of the South of Channel area in the early 1980's before the vegetative cover was removed. Numerous Norway rats (*Rattus norvegicus*) and black rats (*Rattus rattus*) were observed in rip-rap on the north and south banks of the Channel and in abandoned buildings during EIP surveys in June 1997.

No rare, threatened or endangered upland animal species would be expected to occur in such a highly urbanized and disturbed environment, with the possible exception of bats. Because bats may occupy abandoned buildings in urban settings, EIP biologists conducted a survey of abandoned or little-used buildings on the Mission Bay Project Area that would be demolished prior to development. The results of the surveys showed that no bats occur in the Project Area. The project would therefore have no adverse impacts on special-status upland wildlife species. No further discussion of this topic is necessary.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
9. <u>Geology/Topography</u>				
*a. Expose people or structures to major geologic hazards (slides, subsidence, erosion and liquefaction)?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
b. Change substantially the topography or any unique geologic or physical features of the site?	<u> </u>	<u>X</u>	<u>X</u>	<u> </u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

Geology Overview

The Mission Bay Project Area is adjacent to San Francisco Bay and is separated into north and south portions by China Basin Channel. The area's geologic characteristics are described in the Geology & Seismicity section of the 1990 FEIR.⁴² The 1990 FEIR addressed the issues of potential geologic hazards in the Mission Bay Project Area, and provided measures specifically formulated to reduce those hazards. Implementation of the mitigation measures has been superseded, for the most part, by the 1995 San Francisco Building Code and the 1997 Community Safety Element of the City's *General Plan*.⁴³ Hazards of seismicity and inundation by tsunami or seiche will be discussed in the SEIR. The nature of the geologic deposits, and the issues of topography and settlement are discussed below. Further discussion will not be needed in the SEIR. There are no known unique geologic features in the Project Area.

Tsunami and Seiche^{44,45}

Although the Project Area is relatively close to sea level, historical records (including those from the 1906 earthquake) indicate little likelihood of inundation by tsunami or seiche.⁴⁶ Because portions of the proposed project area would be below the level of inundation predicted by the U.S. Army Corps of Engineers' computer models (7.7 feet above mean sea

42. 1990 FEIR, Volume One, Chapter II, and Volume Two, Chapter VI.K.

43. City and County of San Francisco, *Community Safety, An Element of the General Plan of the City and County of San Francisco*, adopted by Resolution 7241 of the San Francisco Planning Commission, September 12, 1994, 25 pages, 7 maps (various scales).

44. Tsunami: a sea wave produced by any large scale, short-duration disruption of the ocean floor, principally by a shallow submarine earthquake, but also by submarine earth movement, subsidence, or volcanic eruption.

45. Seiche: a standing-wave oscillation of the surface of water in an enclosed or semi-enclosed basin (such as a lake, bay, or harbor) that is initiated by landslides, earthquakes, or other geologic phenomena, and continues after cessation of the originating force.

46. 1990 FEIR, Volume Two, p. VI.K.15.

level (-0.8 feet San Francisco City Datum) for the 100-year tsunami event)⁴⁷ and could include excavation for basements below the level of inundation, tsunami and seiche hazards and available techniques for reducing them will be discussed in the SEIR.

Seismic Hazards

The Mission Bay Project Area is subject to earthquake-induced hazards, such as groundshaking and liquefaction. The Project Area is in a Liquefaction Hazard Zone as defined by the State of California *Seismic Hazard Zones Map* for the City and County of San Francisco.⁴⁸ Consequently, San Francisco requires that all new development in the Project Area be preceded by special site-specific investigations to determine the type and degree of hazards present, the appropriate engineering designs to ameliorate the hazards, and the appropriateness of increasing the human population in a Liquefaction Hazard Zone.⁴⁹

The 1990 FEIR addressed the issues of potential seismic hazards in the Mission Bay Project Area, and provided measures specifically formulated to reduce those hazards.⁵⁰ Although implementation of the mitigation measures has been superseded, for the most part, by the 1995 San Francisco Building Code and the 1997 Community Safety Element of the City's *General Plan*,⁵¹ certain hazard reduction techniques applicable to the seismically induced

47. Garcia, A.W., and J. R. Houston, *Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound*, U.S. Army Corps of Engineers Technical Report H-75-17, Hydraulics Laboratory, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi, November 1975, pp. 4-6, and Figure 56.

48. California Division of Mines and Geology, *State of California Seismic Hazard Zones Map, South Half of the San Francisco North and Part of the Oakland West Quadrangles*, March 1, 1997, scale 1:24,000.

49. City and County of San Francisco, *Community Safety, An Element of the General Plan of the City and County of San Francisco*, adopted by Resolution 7241 of the San Francisco Planning Commission, September 12, 1994, 25 pages, 7 maps (various scales).

50. 1990 FEIR, Volume Two, pp. VIII.3 - VIII.4.

51. City and County of San Francisco, *Community Safety, An Element of the General Plan of the City and County of San Francisco*, adopted by Resolution 7241 of the San Francisco Planning Commission, September 12, 1994, 25 pages, 7 maps (various scales).

groundshaking, liquefaction and settlement conditions in the Project Area are not specifically covered in the City's codes or policies. Because of the general concern for public safety in the Mission Bay Project Area, seismic hazards and available techniques for reducing them will be discussed in the SEIR.

Mitigation measures will be included for any significant environmental impacts identified in the analysis.

Topography

Filling, grading, and construction have created an area that has a nearly level to slightly undulating surface sloping very gently toward China Basin Channel, and is about 8 to 12 feet above mean sea level (0 to +4 feet San Francisco City Datum).⁵² Proposed construction in the Project Area would cover most of the ground surface with new structures, paving, or landscaping. Between 1 and 1.5 feet of new fill would be added in low spots east of Third Street to ensure that ground elevations in the Project Area would be above the influence of groundwater, storm waves, and sea level rise, and to provide positive slopes for drainage and sewage systems. As much as 2.5 feet of new fill would be added for these purposes in the central area of Mission Bay South. The total amount of new fill would be about 300,000 cubic yards.⁵³ The additional fill would cause no substantial change in the essentially flat character of the area's topography. The use of minor amounts of fill for these purposes, as included in the currently proposed project, would serve the functions of the mitigation measure (L.15) added to the previous project by the 1990 FEIR.⁵⁴ This issue will not be analyzed further in the SEIR.

52. 1990 FEIR, Volume Two, p. VI.K.1. San Francisco City Datum is 8.66 feet above mean sea level datum.

53. Fred W. DeJarlais, Vice President, KCA Engineers, Inc., telephone conversation, August 28, 1997.

54. 1990 FEIR, Volume Two, p. VI.L.39.

Settlement Potential

The site contains artificial fill, most of it unengineered, placed in Mission Bay during the general filling of Bay-side areas in San Francisco between 1850 and about 1915. The fill is distributed irregularly across the site and, because of its diverse origins, is widely variable in its density, compaction, shrink-and-swell potential, and corrosivity characteristics.

Geotechnical investigations in 1995 by Treadwell & Rollo, Inc. indicate the fill generally is between 10 and 20 feet thick in Mission Bay North, although there are notable exceptions. Near the corner of King and Seventh Streets the fill is 4 feet thick. Less than one block away, near the corner of Townsend and Sixth Streets, the fill is 30 feet thick. At the north end of the Lefty O'Doul Bridge it is 50 feet thick. In Mission Bay South, fill thickness ranges from less than 5 feet to more than 45 feet, being mostly between 10 and 20 feet. Along the south edge of China Basin Channel, the fill is as much as 46 feet thick. Near the center of the proposed UCSF site the fill is between 5 and 15 feet thick. The artificial fill is not suitable as foundation support for large or heavy structures because it is subject to settlement. The weight of a structure founded on the fill would cause compression or shifting of the fill, thus causing the structure to sink (settle), which, in turn, could damage the foundations, floor slabs, or frame of the structure.⁵⁵

Below the fill is 2 to 152 feet of soft, compressible, water-saturated, silty clay known as Bay Mud.⁵⁶ Geotechnical investigations in 1995 by Treadwell & Rollo, Inc. indicate less than 10 feet of Bay Mud underlies the southern edge of Mission Bay South and the northern corner of Mission Bay North. The Bay Mud thickens to more than 100 feet toward the center of the

55. Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, P.E., and Frank L. Rollo, P.E., *Mission Bay, San Francisco, California*, Figure 2, "Thickness of Fill," prepared for Catellus Development Corporation, December 1995, T&R Project 1319.02, map scale 1 inch equals 200 feet.

56. Bay Mud is a layered sequence of soft, plastic, expansive sediments forming the bottom of San Francisco Bay, consisting of clay- and silt-sized particles interspersed with stringers and pockets of peat, fine sand, and minor amounts of gravel, and having a water content ranging between about 30 and 90 percent (commonly 50 to 60 percent in the uppermost 50 to 100 feet of the deposit).

Project Area. Exceptionally thick accumulations of more than 140 feet occur near China Basin Channel between Fifth and Sixth Streets. The Bay Mud is not suitable as foundation support for large or heavy structures for the same reason the overlying fill is not suitable. It is subject to settlement, and structures founded on it would cause compression or shifting of the Bay Mud, leading to settlement damage of the foundations, floor slabs, or frame of the structure.⁵⁷

Below the Bay Mud is an irregular layer of sandy alluvium between 1 and about 30 feet thick, which is underlain by as much as 90 feet of Old Bay Clay, a stiff marine deposit that rests on the Franciscan bedrock (chert, shale, serpentine and sandstone) at depths ranging from less than 5 feet to more than 240 feet below mean sea level (about -13 to about -248 feet San Francisco City Datum).⁵⁸ The alluvium and the Old Bay Clay are suitable for foundation support. Although the sheared (i.e., fractured and broken) bedrock may not be stable during severe seismically-induced groundshaking, the massive (i.e., solid, unfractured) bedrock is very stable in static and dynamic conditions, and therefore is suitable as foundation support.⁵⁹

The project engineers (KCA Engineers, Inc.) worked with geotechnical engineers (Treadwell & Rollo, Inc.) to evaluate soil and seismic conditions for use in the design of pile-supported foundations in the Project Area. Generally, piles between 30 and 60 feet long would be used in the southern third of Mission Bay South. Piles 100 to 140 feet long would be used in the

57. Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, P.E., and Frank L. Rollo, P.E., *Mission Bay, San Francisco, California*, Figure 3, "Thickness of Bay Mud," prepared for Catellus Development Corporation, December 1995, T&R Project 1319.02, map scale 1 inch equals 200 feet.

58. Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, P.E., and Frank L. Rollo, P.E., *Mission Bay, San Francisco, California*, Figure 4, "Elevation of Bottom of Bay Mud," and Figure 5, "Elevation of Top of Bedrock," prepared for Catellus Development Corporation, December 1995, T&R Project 1319.02, map scale 1 inch equals 200 feet.

59. Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, P.E., and Frank L. Rollo, P.E., *Proposed UCSF Site, Mission Bay, San Francisco, CA*, letter report to Kerstin Magary, Catellus Development Corporation, October 31, 1994, 2 pages accompanied by 38 figures.

central and western portions of Mission Bay South and the western half of Mission Bay North. Piles in excess of 140 feet long would be used in the northern half of Mission Bay South and the eastern half of Mission Bay North.⁶⁰ Various methods of reducing settlement hazards in areas not supported by piles would include soil compaction, chemical stabilization, and installation of drains, to be used as necessary if anticipated settlement rates or amounts appeared excessive.⁶¹

Mitigation Measures

Mitigation Measures K.2b and K4, pp. VI.K.47 - VI.K.48, respectively, from the 1990 FEIR would be included in the currently proposed project to reduce the effects of settlement to an insignificant level.

- Design flexible connections between pile-supported structures and unsupported sidewalks, driveways, patios, and paved parking areas. Paved areas would need special strengthening to withstand the stresses created between stationary buildings and settling soils.
- Install leveling jacks in the foundations of structures that do not have pile-supported foundations, or use other available methods to compensate for differential settlement, based on the recommendations of the geotechnical and civil engineers.

The above issues will not be analyzed further in the SEIR.

60. Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, P.E., letter to EIP Associates, March 3, 1997, 1 page accompanied by 6 figures.

61. Frank L. Rollo, P.E., Principal of Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, personal communication, "Soil Conditions and Geotechnical Issues, Mission Bay North" meeting, February 13, 1997.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
10. <u>Water</u>				
*a. Substantially degrade water quality, or contaminate a public water supply?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
*b. Substantially degrade or deplete ground water resources, or interfere substantially with ground water recharge?	<u> </u>	<u>X</u>	<u>X</u>	<u> </u>
*c. Cause substantial flooding, erosion or siltation?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

Construction

Construction of Mission Bay North and Mission Bay South would have erosion impacts similar to those discussed in the 1990 FEIR.⁶² As with the previous plan, erosion and sedimentation during construction for the current project could occur if soil were spread onto surrounding roads and walkways by construction activity and were washed into storm drains and sewers. Erosion and sedimentation could also occur during rainy weather from soil stockpiles or potential soil surcharges, which are piles of clean fill placed on certain areas in order to increase the speed of settlement resulting in denser underlying soils. Suspended solids concentrations could increase in the City's sewer system, China Basin Channel, and San Francisco Bay.

The City's Industrial Waste Ordinance, adopted in 1992, regulates the quality of water discharged into the sewer system and sets limits on the amount of pollutants, including

62. 1990 FEIR, Volume Two, pp. VI.L.13 - VI.L.15.

sediment, that can enter the system.⁶³ The ordinance also regulates the quality of dewatering discharge resulting from excavation and is further described below.

The transport of construction sedimentation into surface waters such as the Channel and Bay is regulated by federal and state storm water regulations. The 1990 FEIR described erosion control measures during construction.⁶⁴ Since certification of the 1990 FEIR, the U.S. Environmental Protection Agency has adopted regulations that require storm water discharges associated with construction activities involving ground disturbance of 5 acres or more to be regulated and covered by a National Pollutant Discharge Elimination System (NPDES) permit. If the area contributing storm water to China Basin Channel or the Bay totals 5 acres or more, then an NPDES permit would be needed for the project. The transport of construction sediment to surface waters will be further analyzed in the Hydrology and Water Quality section of the SEIR. Erosion of contaminated soil will be further discussed in the Contaminated Soils and Groundwater section of the SEIR.

Surface Runoff

The 1990 FEIR found that peak runoff under the three previously proposed alternatives would not significantly change from existing conditions.⁶⁵ Peak runoff under the currently proposed project also would not significantly change because the increase in impermeable surfaces (land coverage) under the current project is not substantially different from that considered in the 1990 FEIR.

The 1990 FEIR evaluated a project that proposed full capture and treatment, up to a five-year storm event, of storm water in the City's combined sanitary and storm water system. A

63. City and County of San Francisco, Department of Public Works, San Francisco Municipal Code, Pt. II, Ch. X (Public Works), Article 4.1, Industrial Waste Ordinance, adopted January 13, 1992.

64. 1990 FEIR, Volume Two, Measures L.1 and L.6, pp. VI.L.35 and VI.L.37.

65. 1990 FEIR, Volume Two, p. VI.L.15.

storm with five-year storm intensity on average occurs once every five years. The project proposes a combination of storm-drain-only, sewer-only, and combined sewer/storm drain systems. Sanitary sewage in the sewer-only and in the combined system would be treated at the City's Southeast Water Pollution Control Plant. Initial storm flows in the storm-drain-only system also would be conveyed to the treatment plant. Subsequent storm water flows in the storm drains would be directly discharged to the Bay or Channel. The Hydrology and Water Quality section of the SEIR will evaluate the impacts of discharging storm water directly to surface waters. Sewer capacity and wastewater treatment capacity issues will be analyzed in the Community Services and Utilities section of the SEIR.

Groundwater

Non-potable water users at Mission Bay would be served by the proposed City reclaimed water system, which would potentially use a blend of imported groundwater and recycled water. The reclaimed City water system is a new city utility being constructed to provide recycled water and groundwater to non-potable water users in the City, and will be discussed further in the Community Services and Utilities section of the SEIR.

The Planning Department analyzed the environmental effects of this use of groundwater in a separate environmental review document, *San Francisco Recycled Water Master Plan and Groundwater Master Plan Final Environmental Impact Report*.⁶⁶ The analysis found that 1) city-wide use of recycled water for irrigation and other uses would reduce the demand for groundwater currently used to meet these demands, mostly affecting the Golden Gate Park, Lake Merced, and Presidio areas; and 2) use of groundwater by the reclaimed water system would contribute to reducing the demand for groundwater pumping at those areas, and would not adversely affect groundwater resources or groundwater recharge. No other water quality impact for groundwater was found in the *San Francisco Recycled Water Master Plan and*

66. City and County of San Francisco, Planning Department, *San Francisco Recycled Water Master Plan and Groundwater Master Plan Final Environmental Impact Report*, SCH No. 940123049, certified August 7, 1997.

Groundwater Master Plan Final Environmental Impact Report. Except as described below, the SEIR will not further analyze effects to groundwater.

Therefore, the project also would not affect groundwater resources or groundwater recharge through its proposed use of reclaimed water. As discussed in the Hazards section of this Initial Study, a comprehensive investigation of the entire Project Area is being conducted to determine the current levels of soil and groundwater contamination within the Project Area. Effects of the project on groundwater quality will be evaluated in the Contaminated Soils and Groundwater section of the SEIR.

Groundwater may be encountered during excavation for utilities. If groundwater were encountered, then the construction area would require dewatering. Disposal of dewatering discharge may occur via the City's sewer, or via transport to an off-site disposal facility. The City categorizes disposal of dewatering discharge into its sewer system as a batch wastewater discharge that would require a permit for disposal into the City's sewer.⁶⁷ Disposal into the sewer system would require an application to be filed at least 45 days prior to the proposed commencement of the discharge. The City would require sampling and testing of the proposed discharge, which must satisfy the water quality limits specified by the City before the City allows the discharge to enter the sewer. Because of existing contamination in Mission Bay, the City would require testing for specific substances related to hazardous waste contamination. If the analysis revealed any contaminant to be over its regulatory concentration limit, pre-treatment of the dewatered groundwater would be required in order to meet the allowable concentration limit prior to discharge into the sewer system. If the limit could not be met through pre-treatment, the contaminated dewatered groundwater would have to be disposed off-site at an approved facility. Dewatering of groundwater will not be evaluated further in the SEIR.

67. City and County of San Francisco, Department of Public Works, Bureau of Environmental Regulation and Management, Requirements for Batch Wastewater Discharges, April 11, 1994.

Mitigation measures will be included for any significant environmental impacts related to water quality identified in the analysis.

Flooding

The 1990 FEIR concluded that structures or roadways placed at elevations at or below -2.0 ft. San Francisco Datum (SFD) could be subject to tidal flooding during the 100-year flood event.⁶⁸ Flooding would occur more frequently if sea levels were to rise. If sea levels were to rise, groundwater levels in localized areas at Mission Bay could rise about the same amount. Flooding issues for development in Mission Bay were adequately addressed in the 1990 FEIR and will not be further analyzed in the SEIR.

The 1990 FEIR reported that the San Francisco Bay Conservation and Development Commission (BCDC) projects a rise of about 5 inches in sea level at the Presidio by the year 2006 and about an 8-inch rise by 2036, and that the rate of rise could be further accelerated beyond that time. Since 1990, considerable research on global warming and potential sea level rise has taken place. This research supersedes the basis of the earlier BCDC analysis. A recent study performed by the U.S. Environmental Protection Agency (U.S. EPA) provides methodology to make a rough estimate of sea level rise.⁶⁹ According to U.S. EPA methods for estimating local sea level rise, an 8-inch rise at San Francisco would occur by about 2025. A rise in sea level would influence the groundwater level at Mission Bay.

Mitigation Measures

The property owners would minimize excavation by installing slabs at the current grade or above in most cases. Substantial amounts of fill would be brought in. Placing structures at grade or above would substantially reduce flooding hazard.

68. 1990 FEIR, Volume Two, p. VI.L.19 and Volume Four, p. XV.J.4.

69. Titus, James G.; Narayanan, Vijay K., U.S. Environmental Protection Agency, *The Probability of Sea Level Rise*, Washington, D.C., 1995.

The 1990 FEIR recommended design and site-planning mitigation measures that would avoid flooding of new development at Mission Bay if implemented.⁷⁰ Mitigation Measure L.15, pp. IV.L.39 - IV.L.40 has been revised to apply to the current project. The Redevelopment Agency documents shall require that detailed construction specifications to reduce the impacts of a sea-level rise shall be performed by a licensed engineer. Such measures may include: setback from the water's edge; installation of seawalls, dikes, and/or berms during construction of infrastructure; reducing the amount of excavation for utilities or basements; and use of topsoil to raise the level of public open spaces.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
11. <u>Energy/Natural Resources</u> ⁷¹				
*a. Encourage activities which result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner?	<u>X</u>	<u> </u>	<u>X</u>	<u> </u>
b. Have a substantial effect on the potential use, extraction, or depletion of a natural resource?	<u> </u>	<u>X</u>	<u> </u>	<u> </u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

Pacific Gas and Electric Company (PG&E) is the main supplier of electricity and natural gas for Northern and Central California, and is the public utility supplying power and gas to San

70. 1990 FEIR, Volume Two, Mitigation Measure L.15, pp. IV.L.39 - VI.L.40.

71. Energy is the capacity for doing work and takes several forms. One form may be changed to another, such as burning natural gas to produce steam to drive a turbine which produces electricity. Most of the world's convertible energy comes from fossil fuels that are burned to produce heat. Energy is measured in terms of the work it is capable of doing. Electric energy is usually measured in kilowatt hours (kWh); natural gas in million cubic feet (MMcf). Both may be converted to units of British thermal units (Btu); 1 Btu is the quantity of heat necessary to raise the temperature of 1 pound of water 1 degree Fahrenheit. A kilowatt is a measure of power, or heat flow rate, and one kWh equals 3,413 Btu per hour.

Francisco. Adopted in 1996 and effective January 1, 1998, Assembly Bill 1890 (AB 1890) will restructure the electric industry into a competitive market with the intent of lowering electricity costs to consumers. While large consumers of electricity already have some choice in suppliers, AB 1890 will extend choice to all consumers, including residential consumers. Consumers will be allowed to purchase electricity from suppliers other than PG&E. Deregulation will not directly affect the overall energy supply for the state. The state of California does not currently experience an energy shortage, and supply is plentiful at present.

In response to AB 1890, PG&E is currently divesting several power plants. PG&E will continue to own transmission and distribution facilities along with some generation facilities, and will offer electric service to customers who request it. Impacts of the project on transmission capacity and infrastructure will be further discussed in the Community Services and Utilities section of the SEIR.

Operational Energy Consumption

Current energy consumption at Mission Bay is approximately the same as consumption in 1987. The Mission Bay Golf Center was constructed in December 1992. Little land use change has otherwise occurred that would cause a substantial change in the amount of energy consumed by Mission Bay since the 1990 FEIR. It also is assumed that there has been no large-scale replacement or upgrade of existing energy-using fixtures (e.g., machinery, appliances, heating, cooling, and lighting) with more energy-efficient ones. Therefore, current electricity use by commercial and industrial uses is about 11.6 million kilowatt-hours (kWh), or about 119 billion Btu, per year, and natural gas use is about 37 million cubic feet (MMcf), or about 41 billion Btu, per year, as calculated in the 1990 FEIR.⁷² Over the last 10 years, overall electricity consumption in San Francisco has increased from 3.8 billion

72. 1990 FEIR, Volume Two, pp. VI.H.3 - VI.H.4.

kWh annually, and natural gas consumption has decreased from 35,000 MMcf.⁷³ Citywide electricity consumption for 1996 was about 5 billion kWh, and natural gas consumption was about 26,000 MMcf.⁷⁴

Because existing land uses have not changed since 1987, transportation patterns also are assumed to be approximately the same between Mission Bay and outlying areas. Thus, transportation energy use is assumed to be similar to that calculated in the 1990 FEIR, about 420 billion Btu consumed annually to provide about 71 million passenger-miles of travel. With the decommissioning of older vehicles and the introduction of newer, more fuel-efficient, vehicles on the road during the past decade, present transportation energy use is probably slightly lower than estimated.

The project proposes a mix of land uses that are different from the alternatives evaluated in the 1990 FEIR. As shown in Table 2, the project would consume approximately 206 million kWh/yr of electricity, increasing present electricity use at Mission Bay by about 18 times. Electricity consumption at Mission Bay would be about 4% of existing citywide consumption. About 1,070 million cubic feet (MMcf) per year of natural gas would be consumed, increasing present natural gas use at the site by about 29 times. Natural gas consumption at Mission Bay would be about 4% of citywide consumption. Energy consumption by the project would be about 2,109 billion Btu/yr, similar to the energy consumption of 2,100 billion Btu/yr estimated in the 1990 FEIR for Alternative A.⁷⁵

As discussed in the 1990 FEIR, buildings in Mission Bay would be required by law to comply with either the prescriptive or performance requirements of Title 24 Energy

73. 1990 FEIR, Volume Two, p. VI.H.4.

74. Andrea Gough, Associate Energy Specialist, California Energy Commission, memorandum to Rita Lee, EIP Associates, July 25, 1997.

75. 1990 FEIR, Volume Two, Table VI.H.2, p. VI.H.12.

TABLE 2
MISSION BAY PROJECT: ANNUAL OPERATIONAL ENERGY CONSUMPTION AT BUILD-OUT

Land Use	Building Floor Area (gsf)	Annual Energy Consumption			
		Electricity Consumption Factor (kWh/gsf-yr) /a/	Natural Gas Consumption Factor (cu ft/gsf-yr) /a/	Electricity (kWh)	Natural Gas (MMcf)
Commercial Industrial	5,557,000	23.05	26.84	128,088,850	149
UCSF /b/	2,650,000	N/A	N/A	61,500	543
Neigh. Retail	257,000	8.51	5.08	2,187,070	1
City-serving Retail	805,000	48.03	23.62	38,664,150	19
Cmc./Enter.	445,000	38.97	114.5	17,341,650	51
Comm. Fac. /c/	170,537	8.1	29.08	1,381,353	5
Hotel, 500 rooms /d/	480,000	6.07	32.93	2,913,600	16
Residential	6,090	2,500	47,000	15,225,000	286
TOTAL				205,863,173	1,070
					2,108,957

Notes:

gsf = gross square feet
kWh = kilowatt hour
cu ft = cubic feet
MMcf = million cubic feet
Btu = British thermal units

- Based on unpublished commercial model data from California Energy Commission July 1995 forecast. Information provided by Richard Rohrer, Assistant Chief Forecaster, California Energy Commission, July 17, 1997.
- University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, SCH No. 95123032, January 1997, p. 464.
- For police, fire station, and school, assumes 75% coverage of site.
- Assumes 800 sq. ft. per room, plus 20% additional floor area.
- City and County of San Francisco, Department of City Planning, Mission Bay FEIR, 1990, Table XIV.H.5.

Source: EIP Associates

Conservation Standards.⁷⁶ Compliance with Title 24 would be enforced by the San Francisco Department of Building Inspection, through the building permit review process. Such compliance would mean that the project would adequately conserve energy and would not use energy in a wasteful manner.

Transportation energy consumption by the projects would amount to about 3,200 billion Btu/yr (see Table 3).⁷⁷ Most of the transportation energy consumption would be by automobiles with about 2,530 billion Btu consumed per year, equivalent to about 24 million gallons of gasoline. The California Energy Commission estimates that about 2,627 million gallons of gasoline and 534 million gallons of diesel would be used annually in the San Francisco region by the year 2010.⁷⁸

Construction Energy Consumption

Construction of buildings and infrastructure would require both direct and indirect expenditures of energy. As discussed in the 1990 FEIR, indirect energy represents about three-quarters of total construction energy and includes the energy consumed in all of the industries that contributed to the production of the construction materials. Direct energy represents about one-quarter of total construction energy.⁷⁹ The total construction energy that would be consumed by the project is about 20,645 billion Btu, which would be approximately equivalent to 3.6 million barrels of crude oil (see Table 4).

76. 1990 FEIR, Volume Two, p. VI.H.20.

77. The energy calculations for transportation were based on preliminary trip generation data. The trip generation data in the Draft EIR show lower numbers of peak-hour and daily trips. Therefore, the transportation energy estimate in this Initial Study is a conservative one.

78. California Energy Commission, 1993 - 1994 *California Transportation Energy Analysis Report, Technical Appendices, Draft*, February 1994, Table 2C-2, Transportation Energy Consumption by Region.

79. 1990 FEIR, Volume Two, p. VI.H.7.

TABLE 3
MISSION BAY PROJECT:
ANNUAL TRANSPORTATION ENERGY CONSUMPTION AT BUILD-OUT

Mode	Annual Miles Traveled	Energy Consumption Factor [Btu/mi] /a/	Btu, millions
Auto /b/	424,003,971	5,965	2,529,184
BART	71,514,217	2,400	171,634
AC Transit	14,348,800	3,200	45,916
Charter Bus	7,683,468	3,200	24,587
GG Transit Bus	17,892,143	3,200	57,255
Ferry	2,792,443	1,600	4,468
SamTrans	7,388,570	3,200	23,643
Caltrain	34,910,424	3,000	104,731
MUNI	34,331,319	2,900	99,561
MUNI Metro /c/	52,208,201	2,900	<u>151,404</u>
TOTAL			3,212,383

Notes:

- Unless otherwise indicated, all consumption factors are from City and County of San Francisco, Department of City Planning, Mission Bay FEIR, 1990, Table XIV.H.16.
- Consumption factor based on fuel efficiency factor (21.4 miles per gallon of gasoline and gasoline equivalent) as found in California Energy Commission, 1993 - 1994 *California Energy Analysis Report*, Technical Appendices, Draft, February 1994, Table 2C-5, California Vehicle Fuel Efficiency. Converted fuel efficiency factor to Btu/mile using 127,650 Btu/gallon of gasoline.
- MUNI Metro is probably a lower consumer of energy than MUNI trolleys and diesel buses, but no information is available from MUNI to estimate consumption per passenger mile (Bill Nielson, Principal Engineer, San Francisco Transportation Commission, MUNI Capital Projects Division, telephone conversation, July 22, 1997). Therefore, consumption is conservatively assumed to be same as for MUNI trolleys and diesel buses.

Source: EIP Associates.

TABLE 4
MISSION BAY PROJECT:
ESTIMATED TOTAL CONSTRUCTION ENERGY CONSUMPTION AT BUILD-OUT

Land Use	Floor Area of New Construction (gsf)	Construction Energy Consumption Factor (Btu/gsf) /a/	Construction Energy Consumption (Btu, millions)
Commercial Industrial	5,557,000	1,640,000	9,113,480
UCSF	2,650,000	1,640,000	4,346,000
Neigh. Retail	257,000	940,000	241,580
City-serving Retail	805,000	940,000	756,700
Cmc./Enter.	445,000	1,640,000	729,800
Comm. Fac. /b/	170,537	1,450,000	247,279
Residential /c/	7,308,000	650,000	4,750,200
	Street Length [ft]	[Btu/linear ft]	
Infrastructure /d/	64,300	7,160,000	460,388
TOTAL			20,645,427

Notes:

gsf = gross square feet

Btu = British thermal units

ft = feet

- Based on construction factors used in 1990 FEIR, pp. XIV.H.2 - XIV.H.4.
- For police, fire station, and school, assumes 75% coverage of site.
- Assumes average of 1,200 gsf per dwelling unit.
- Infrastructure includes streets, sewers, storm drains, water supply, electrical service, natural gas service, and telephone service. Infrastructure construction energy consumption is related to street length; street lengths measured from Catellus Development Corporation, Mission Bay Conceptual Framework for a Proposal for the Catellus Development Portion of the South of Channel Redevelopment Plan Area, Exhibit C, Infrastructure Plan, Exhibit 2, Street Surface Improvements; and from KCA Engineers, Inc., Mission Bay North of Channel Improvements, Drawing No. 97.0110, November 1, 1996.

Source: EIP Associates.

Energy consumption estimates for the proposed project are similar to those provided in the 1990 FEIR for Alternative A.⁸⁰ No significant impacts were shown as a result of information in the 1990 FEIR; a review of that information and updated calculations do not show new significant environmental effects from the proposed project. Therefore, the topic will not be discussed further in the SEIR.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
12. <u>Hazards</u>				
*a. Create a potential public health hazard or involve the use, production or disposal of materials which pose a hazard to people or animal or plant populations in the area affected?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
*b. Interfere with emergency response plans or emergency evacuation plans?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
c. Create a potentially substantial fire hazard?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

The proposed project would involve the use, production or disposal of materials that pose hazards to people or animal or plant populations. For purposes of analysis, these hazards can be divided between those related to existing conditions in the Project Area (e.g., soil and groundwater contamination and hazardous materials in existing buildings) and those related to new uses proposed as part of the project, such as campus uses, research and development, and light industry.

80. 1990 FEIR, Volume Two, Table VI.H.2, p. VI.H.12.

The Mission Bay Project Area contains certain known and potentially contaminated sites, as well as groundwater contamination. Contamination within the Project Area may be directly related to past uses. A detailed description of past uses in the area and potential soil and groundwater contamination issues associated with each use is contained in the 1990 FEIR on pp. VI.N.5 through VI.N.17; this information will be summarized and incorporated by reference in the SEIR.

Since the 1990 FEIR was certified, various site assessments have been conducted in areas of concern throughout the Project Area. More recently, a comprehensive investigation of the entire Project Area is being conducted to determine the current levels of soil and groundwater contamination within the Project Area.⁸¹ The SEIR analysis will incorporate by reference and summarize new data and conclusions in order to assess the potential impacts to workers and new residents associated with the proposed project. In addition, the SEIR will discuss possible remediation procedures and mitigation measures and will discuss the applicability of the City's Hazardous Waste in the Soils Ordinance, known as the "Maher Ordinance" (Article 20, Public Works Code).

The SEIR will also contain an analysis of other types of hazardous materials contamination that could exist within the Mission Bay Project Area due to the age and historic use of buildings. These structures could contain asbestos and/or lead-based paints. Old fluorescent light fixtures, transformers, or capacitors, which could contain polychlorinated biphenyl (PCB) oils could also still be present on the site. The potential presence of these types of hazardous materials will be investigated and potential adverse impacts will be determined. Appropriate mitigation measures and/or remediation recommendations will be presented.

The SEIR analysis will include a discussion of regulatory review and compliance requirements that are applicable to the proposed project.

81. Val F. Siebal, Chair, Site Designation Committee, California Environmental Protection Agency, letter and attached Resolution No. 97-10, July 15, 1997.

Regarding potential hazards related to new uses proposed under the project, such as campus uses, research and development, and light industry, these uses would likely involve the use, storage, and disposal of hazardous materials. Therefore, the SEIR will assess the possible resulting environmental impacts of these activities. In particular, the SEIR will discuss potential impacts pertaining to hazardous chemicals, radioactive materials, and biological agents at the project site. The analysis will consider potential hazards to workers and the public, and evaluate both routine operating scenarios and possible upsets (i.e., accidents). The analysis will also address hazards related to transporting hazardous materials through the Project Area. In addition, the SEIR will discuss the impact of increased hazardous waste generation (including radioactive and medical waste generation) as a result of increased development. To provide a thorough context for the analysis, the SEIR will also discuss impacts related to the use, storage, and disposal of hazardous materials by new households and typical commercial enterprises. Wastewater disposal into the City's sewer and storm water system from research facilities proposed along the western and southern boundaries of the Project Area and from UCSF would be subject to the City's Industrial Waste Ordinance (see discussion of the Ordinance in Section IV.B.10, Water, above). This issue will not be discussed further in the SEIR.

Project development could result in the need for additional emergency response planning. The SEIR will evaluate potential conflicts with existing emergency response plans or emergency evacuation plans, including the Community Safety Element of the *San Francisco General Plan* and the City's Emergency Operations Plan. Further, the SEIR will evaluate the adequacy of existing emergency response services, including the ability to respond to hazardous materials emergencies.

In most cases, the project would not substantially increase fire hazards in the Project Area because new development would conform to the life safety provisions of the San Francisco Building Code and Title 24 of the California Code of Regulations. The projects could also replace some older buildings constructed before these codes were enacted. Therefore, routine fire safety will not be discussed further in the SEIR. Nevertheless, some of the

proposed research and development and light industrial uses would pose special hazards related to the use of hazardous materials (e.g., fires or releases), and the SEIR will assess these hazards and identify measures to reduce them, if necessary.

Mitigation measures will be included for any significant environmental impacts related to hazardous materials and hazardous wastes identified in the analysis.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
13. <u>Cultural</u>				
*a. Disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group; or a paleontological site except as a part of a scientific study?	<u>X</u>	<u> </u>	<u>X</u>	<u> </u>
b. Conflict with established recreational, educational, religious or scientific uses of the area?	<u> </u>	<u>X</u>	<u> </u>	<u> </u>
c. Conflict with the preservation of buildings subject to the provisions of Article 10 or Article 11 of the City Planning Code?	<u>X</u>	<u> </u>	<u>X</u>	<u> </u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

As discussed in the 1990 FEIR,⁸² and incorporated by reference into this Initial Study, archival research regarding Mission Bay identified areas of potential prehistoric and historic subsurface archaeological resources. The 1990 FEIR analysis was based upon *Cultural*

82. 1990 FEIR, Volume II, pp. VI.J.1 to VI.J.29.

Resources Evaluation for the Mission Bay Project, San Francisco, California, David Chavez & Associates, 1987. Although one portion of the current Mission Bay Project Area was not within the boundaries of the 1990 FEIR alternatives, namely the Castle Metals site⁸³, the 1990 FEIR analysis did evaluate cultural resources beneath the Castle Metals site.⁸⁴

The 1990 FEIR found that the potential for prehistoric, Native American sites was low, as there are no known sites, but could not be entirely discounted. In addition, the potential for historic resources reflects nineteenth century and early twentieth century land use of Mission Bay for industrial purposes and as a City dump. The 1990 FEIR concluded that development under the Mission Bay Plan could disturb potentially significant prehistoric and historic resources, and identified mitigation measures to reduce or avoid impacts on cultural resources.

A recent (1997) review of archaeological resources information by David Chavez & Associates confirmed information in the 1990 FEIR, and did not identify any new information that would alter the discussions or conclusions in the 1987 Chavez report.⁸⁵

The 1990 FEIR identified areas within Mission Bay of subsurface prehistoric and historic archaeological resources, seven specific areas of historical resource potential, and three historic structures potentially eligible for the National Register of Historic Places (the Lefty O'Doul Bridge crossing China Basin Channel at Third Street, the Peter Maloney Bridge at Fourth Street, and the closed Station 30 Firehouse at Third Street near Mission Rock Street).⁸⁶

83. The Project Area consists of Catellus-owned land and three other sites under private ownership, the Castle Metals site, the Esprit site, and the Third Street site.

84. 1990 FEIR, Volume II, p. VI.J.17 (Figure VI.J.1).

85. David Chavez & Associates, *Archaeological Resources Review for the Mission Bay Project Subsequent EIR, San Francisco, California*, August 18, 1997.

86. 1990 FEIR, Volume Two, Figure VI.J.1, p. VI.J.17, and pp. VI.J.14 - VI.J.18.

Closed Fire Station 30 may be eligible for the National Register of Historic Places. The project includes the development of police and fire facilities on about 3 acres of land, including the site of Fire Station 30. The potential demolition of Fire Station 30 will be discussed in the SEIR.

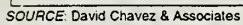
The FEIR also identified the basalt pavement blocks found on parts of King Street between Third and Seventh Streets, and on Sixth Street near King, as of local interest but not eligible for the National Register. The basalt block paving has been removed as a result of rebuilding of King Street for the MUNI Metro light rail extension and new I-280 on- and off-ramps. Other than these basalt blocks, the cultural resource potential at Mission Bay is as described in the 1990 FEIR. Figure 5 in this Initial Study illustrates cultural resources potential in Mission Bay as of 1997. Table 5 lists the potentially significant historic archaeological deposits, potential resource areas, identified in Figure 5.

Development under the proposed Mission Bay Redevelopment Plans could disturb potential subsurface archaeological resources. The project would include the following mitigation measures to avoid significant adverse effects on cultural resources. These measures update the mitigation identified in the 1990 FEIR.

Mitigation Measures

Prehistoric Archaeological Resources

The entire Mission Bay Project Area has at least some sensitivity for the presence of unknown archaeological remains. Prehistoric cultural deposits could be encountered in three identified areas and unknown historical features, artifact caches, and debris areas could be located anywhere in the Project Area. Excavation crews would be instructed, the Agency and/or the City (the Environmental Review Officer (ERO) and President of the Landmarks Preservation Advisory Board (LPAB)) would be notified, and recovery measures would be developed, as described below.



MISSION BAY SEIR INITIAL STUDY

FIGURE 5 CULTURAL RESOURCES

TABLE 5
POTENTIALLY SIGNIFICANT HISTORICAL ARCHAEOLOGICAL DEPOSITS

1. Steamboat Point, a shipbuilding area of the 1850s and early 1860s. Steamboat Point was located in the two blocks bounded by Third, Fourth, Townsend and Berry Streets.
2. Point San Quentin/Point Potrero, another early shipbuilding area, occupied beginning in the early 1860s, defined by 16th Street, Illinois Street, Mariposa Street and Pennsylvania Avenue. This area includes the 1860s to 1880s shipbuilding yards of P.H. Tiernan and the Dickie Brothers at Third and Mariposa Streets.
3. The east side of Minnesota Street between Mariposa and 17th Streets -- the location of the Pacific Glass Works (1863 to 1876).
4. The south side of Townsend Street between Third and Fourth Streets -- the original site of San Francisco Glass Works (1865 to 1870).
5. The block bounded by King, Berry, Fourth, and Fifth Streets -- the second location of the San Francisco Glass Works (1870 to 1886).
6. The south side of Berry Street between Fifth and Seventh Streets -- the area of shipbuilding yards of Alexander Hay and Boole and Beaton (1880s).
7. The area bordered by Berry, Fifth and Seventh Streets, south to where a line extended from Irwin Street would meet Fifth Street -- the City dump from the 1870s to the early 1890s.

Source: 1990 FEIR, p. VI.J.18.

Mitigation Measure J.7, p. VI.J.27 of the 1990 FEIR, requires that in the event that prehistoric archaeological deposits are discovered, the developer must consult with the California Native American Heritage Commission and obtain a list of appropriate local Native American contacts; dialogue with the Agency and/or the City and the archaeological consultant would take place to develop acceptable archaeological testing and excavation procedures, particularly in regard to the disposition of cultural materials and Native American burial remains.

Historic Archaeological Resources

With the exception of some limited archaeological testing in the past, very little is known about the actual areal extent, specific nature and location of historic features and artifact caches, and depositional integrity of potential historic archaeological deposits. Specific information of that nature is important in determining the significance of archaeological resources and in developing appropriate mitigation plans. Pre-construction archaeological testing and construction monitoring would be appropriate for six of the seven identified historic resource areas (see Figure 5); archaeological monitoring during construction only, rather than pre-construction testing, would be appropriate for the seventh area, the location of the nineteenth-century City dump.

Mitigation Measure J.1, pp. VI.J.22 - VI.J.24, of the 1990 FEIR has been included in the current SEIR project. The following procedures shall be used for the six areas:

- A) Retain the services of a qualified archaeologist, because of the strong possibility of encountering the remains of cultural or historic artifacts or features in the six historic resources areas. The archaeologist shall consult with the Agency and/or the City and shall determine prior to commencement of development activities: 1) whether the archaeologist should instruct all excavation and foundation crews on the project site of the potential for discovery of historic archaeological deposits and artifacts, and the procedures to be followed if such materials are uncovered; and 2) whether a program of archaeological testing prior to the commencement of foundation excavation is required. *Any archaeological testing plan or program shall be prepared to include consideration of the program developed to manage hazardous wastes in soil in the project area.* (Updated language in italics.) As described in Mitigation Measure J.2, p. VI.J.24, the testing program could include the following procedures:

- 1) Define specific research parameters and prepare a written study plan prior to subsurface exploration, with emphasis on National Register determination of historical significance and the maximum retrieval of archaeological data.
 - 2) Examine large-scale exposure of soil profiles.
 - 3) Complete detailed field records, including photographs and drawings, to document subsurface soil profiles, archaeological deposits and integrity of such deposits.
 - 4) Complete a detailed report of findings to describe research and exploration methodologies, testing results, all archaeological finds and recommendations for resource management.
- B) Retain a qualified historical archaeologist to supervise a pre-foundation excavation testing program in identified historic resource areas for each phase of Project Area development or each construction site, as appropriate, using a series of mechanical, exploratory boring and/or backhoe trenches or other testing methods determined by the archaeologist to be appropriate. A qualified historical archaeologist would supervise the testing at the site to determine the probability of finding significant cultural and historical remains. At the completion of the archaeological testing program, the archaeologist would submit a written report first and directly to the Agency and/or the City, with a copy to the project sponsor, which describes the findings, assesses their potential significance and proposes appropriate recommendations for any additional procedures necessary for the mitigation of adverse impacts to cultural resources determined to meet significance criteria. *Additional procedures could include excavation and retrieval of significant archaeological resources and photographic documentation prior to project construction, and archival research and report preparation after in situ retrieval and photography is complete.* (Updated language in italics.)

- C) Retain an archaeologist to supervise a program of on-site monitoring during site excavation in the identified historic resource areas, following site clearance and pre-excavation testing. The archaeologist would record observations in a permanent log. Should cultural or historic artifacts be found following commencement of excavation activities, the archaeologist would assess the significance of the find, and immediately report to the Agency and/or the City. Upon receiving the advice of the consultants, the Agency and/or the City would recommend specific mitigation measures, if necessary. The monitoring program, whether or not there are finds of significance, would result in a written report to be submitted first and directly to the Agency and/or the City, with a copy to the project sponsor.
- D) Should important artifacts be found during excavation, suspend excavation or construction activities which might damage discovered cultural resources for a total maximum of four weeks over the course of construction at each site to permit inspection, recommendations and retrieval, if appropriate.
- E) Implement an appropriate security program to prevent looting or destruction, if cultural resources of potential significance are discovered. Any recovered cultural artifact assessed as significant by the archaeologist upon concurrence by the Agency and/or the City would be placed in a repository designated for such materials or possibly exhibited in a public display. Following approval of the archaeological testing and monitoring program reports by the Agency and/or the City, a final report would be sent to the Foundation for San Francisco's Architectural Heritage and the State Office of Historic Preservation.

Regarding the late-nineteenth-century City dump site, archival review suggests that depositional integrity has been lost because of scavenging while the dump was in operation; however, important historical artifacts may still be present. In addition, while the Project Area other than the seven areas discussed above are considered to have low potential for cultural resources, and pre-construction archaeological testing is not required, evidence of

resources could be found during ground disturbance at the site. If this were to occur, the following Mitigation Measure J.3, p. VI.J.25, would be implemented:

- A) Should evidence of archaeological resources of potential significance be found during ground disturbance, the Project Sponsor shall immediately notify the Agency and/or the City and shall suspend any excavation which the Agency and/or the City determines could damage such archaeological resources. Excavation or construction activities which might damage discovered cultural resources shall be suspended for a total maximum of four weeks over the course of construction.
- B) After notifying the Agency and/or the City, the Project Sponsor shall select an archaeologist to assist the Agency and/or the City in determining the significance of the find. The archaeologist shall prepare a draft report containing an assessment of the potential significance of the find and recommendations for what measures should be implemented to minimize potential effects on archaeological resources. Based on this report, the Agency and/or the City shall recommend specific additional mitigation measures to be implemented by the Project Sponsor.
- C) Mitigation measures might include a site security program, additional on-site investigations by the archaeologist, and/or documentation, preservation, and recovery of cultural materials. Finally, the archaeologist shall prepare a draft report documenting the cultural resources that were discovered, and evaluation as to their significance, and a description as to how any archaeological testing, exploration and/or recovery program was conducted.
- D) Copies of all draft reports prepared according to this mitigation measure shall be sent first and directly to the Agency and/or the City for review. Following approval by the Agency and/or the City, copies of the final report(s) shall be sent by the archaeologist directly to the California Archaeological Site Survey Northwest Information Center. Three copies of the final archaeology report(s) shall be submitted to the Agency and/or

the City, accompanied by copies of the transmittals documenting its distribution to the California Archaeological Site Survey Northwest Information Center.

Prehistoric and historic archaeological resources will not be further discussed in the SEIR.

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
C. OTHER				
Require approval of permits from City Departments other than Department of City Planning or Bureau of Building Inspection or from Regional, State or Federal Agencies?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>

Permits and approvals to be discussed in the SEIR include, but are not limited to, the following:

- Planning Commission and Redevelopment Agency Commission, jointly: Certification of the Final SEIR.
- Planning Commission: Adoption of General Plan amendments; approval of rescission of Article 9 of the City Planning Code; determination of General Plan consistency of Redevelopment Plans; endorsement of Designs for Development.
- Redevelopment Agency Commission: Adoption of the Redevelopment Plans and Designs for Development.
- Board of Supervisors: Approval of CEQA findings, Mitigation Monitoring Plan, and adoption of Redevelopment Plan; adoption of rescission of Article 9 of the City Planning Code; approval of General Plan amendments; approval of street vacations.
- Port Commission: *Waterfront Land Use Plan* amendments and findings; street vacations.
- Department of Public Works: Approval of parcel and condominium maps.

- Department of Public Health (DPH): Food and beverage permits for specific businesses within Mission Bay; administration of requirements for Hazardous Materials Business Plans; review of Article 20 Site Mitigation Plans.
- Bay Conservation and Development Commission: Review of compliance with requirements set forth in the *San Francisco Bay Plan* and *San Francisco Waterfront Special Area Plan*; permits for work within the Bay and the 100 ft. shoreline band such as promontories or rip-rap along the Channel.
- Bay Area Quality Management District (BAAQMD): Permits for specific uses or tenants locating in the Project Area, such as industrial and research and development facilities that would cause pollutant emissions.
- Regional Water Quality Control Board (RWQCB): Approval of Risk Management Plans and issuance of final site clearance for specific development sites; National Pollutant Discharge Elimination System permit for storm water discharges, if project includes separated sewers, and untreated outfall of stormwater sewage to the Channel or the Bay.
- State Public Utilities Commission: Approval of changes to existing rail crossings and new rail crossings.
- Agencies with jurisdiction over alterations to the Channel include the Department of Fish and Game, the U.S. Army Corps of Engineers, and the U.S. Coast Guard.
- Agencies with potential permitting and/or oversight authority with regard to hazardous materials include: California Division of Occupational Safety and Health Administration (Cal-OSHA) and the federal Occupational Safety and Health Administration, California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), DPH, RWQCB, BAAQMD, the U.S. Department of Transportation, the California Highway Patrol and the California Department of Transportation.

		<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
D. MITIGATION MEASURES					
1.	Could the project have significant effects if mitigation measures are not included in the project?	<u>X</u>	<u> </u>	<u>X</u>	<u>X</u>
2.	Are all mitigation measures necessary to eliminate significant effects included in the project?	<u> </u>	<u>X</u>	<u> </u>	<u>X</u>

Table 6 summarizes mitigation measures from the 1990 FEIR related to topics determined to require no further analysis in the SEIR. The SEIR will contain a mitigation chapter that will incorporate the measures and also include other measures that would be, or could be, adopted to reduce potential significant adverse effects of the project as identified in the SEIR. Some of these measures are updated to conform with current City practice. Any revisions to previously proposed mitigation measures are shown in italics. In accord with CEQA Section 15150(a), the mitigation measures from the 1990 FEIR are incorporated by reference; thus, a summary of each measure as well as a page reference to the 1990 FEIR is provided.

Table 7 summarizes additional mitigation measures related to topics determined to require no further analysis in the SEIR. These measures are included in the 1990 FEIR, however they are not proposed for inclusion in the SEIR. These measures are of three types: measures that provide a means of complying with existing regulations or that have since been incorporated into existing regulations; measures that address less-than-significant effects (such measures are now referred to as "improvement measures" by the City); and measures that are otherwise not applicable to the current SEIR project.

TABLE 6
1990 FEIR MEASURES INCLUDED IN THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure to Mitigate Potentially Significant Impact	Improvement Measure to Reduce Less-Than- Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project
I.10	Require review of designs for large buildings by a qualified wind consultant and to the extent feasible reduce wind speed and turbulence to facilitate public use of adjacent spaces. (p. VI.I.75) <i>The Redevelopment Agency would require developers of high-rise structures above 100 ft. to conduct a microclimate analysis, including wind-tunnel studies, to determine design-specific impacts on hazard criteria and to provide a basis for design modifications to mitigate these impacts. Projects within Mission Bay, including UCSF, would be required to meet this standard or to mitigate exceedances through building design.</i>	X		X	
J.1	Retain the services of an archaeologist to instruct construction crews regarding potential historic archaeological resources and appropriate procedures to follow if they are uncovered, establish preconstruction testing programs and recommend any further mitigation measures required and supervise on-site monitoring during excavation in the six historic resource areas. (p. VI.J.22)	X		X	
J.2	Develop archaeological exploration programs for pre-identified sensitive historic archaeological areas. (p. VI.J.23)	X		X	
J.3	Retain the services of an archaeologist to provide archaeological monitoring during construction in the area occupied by the late 19th- century city dump. (p. VI.J.25)	X		X	
J.7	In the event that prehistoric archaeological deposits are discovered, consult local Native American organizations regarding acceptable testing and excavation procedures. (p. VI.J.27)	X		X	

(continued)

TABLE 6 (cont.)
1990 FEIR MEASURES INCLUDED IN THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure to Mitigate Potentially Significant Impact	Improvement Measure to Reduce Less-Than- Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project
K.2b	Design connections between pile-supported structures and unsupported sidewalks and driveways to reduce the likelihood of separation due to settlement. (p. VI.K.47)	X		X	
K.4	If shallow foundations are used for any buildings, install leveling jacks as part of the foundations or use other available methods to compensate for differential settlement, where feasible. (p. VI.K.47)	X		X	
K.7	As required by City guidelines, design surface drainage systems, storm drains, and sewers to accommodate future settlement. (p. VI.K.49)	X		X	
K.8	Test soils for sulfate and chloride content. If necessary, use admixtures in concrete and/or coated metal pipes to resist corrosion. (p. VI.K.49)	X		X	
L.15	Protect low-lying areas from a potential rise in sea level. <i>Detailed construction specifications to mitigate against impacts of a sea-level rise would require specific flood protection engineering and building analysis by a licensed engineer. (p. VI.L.39)</i>	X		X	

TABLE 7
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
G.1	Comply with the construction-related provisions of the San Francisco Noise Ordinance. Construct noise barriers around construction sites and provide noise shielding for stationary construction equipment, such as compressors. (p. VI.G.30)	X				Means of complying with the San Francisco Noise Ordinance (Article 29, San Francisco Police Code.)
G.2	Implement appropriate measures to reduce pile-driving noise, as determined by the City in consultation with the construction engineers. (p. VI.G.31)	X				Regulated by section 2907(c) of the San Francisco Noise Ordinance.
H.1	Where feasible replace energy-intensive materials and construction methods with less-intensive ones. (p. VI.H.21)		X			Measures to increase energy efficiency beyond that required by law.

(continued)

TABLE 7 (cont.)
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
H.2, a-n	Use energy-efficient appliances, require building system operation and maintenance plans, consider provision of recycling facilities, provide load management guidelines, use natural cooling, consider passive solar space heating, incorporate energy management and control systems where feasible, meter the electricity and natural gas use of residential units on an individual basis and commercial tenants on at least a floor-by-floor basis, consider the energy implications of landscaping and building orientation, optimize glazing, and study the use of photovoltaics. The City and PG&E are to conduct a five-year feasibility study of the potential for District Heating and Cooling, daylighting, and cogeneration. (p. VI.H.21)		X			Measures to increase energy efficiency beyond that required by law.
H.3	Reduce transportation energy consumption through measures to decrease vehicle trips (p. VI.H.25)		X			Measures to increase energy efficiency beyond that required by law.

(continued)

TABLE 7 (cont.)
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
I.7	To the extent consistent with other land use considerations and design criteria articulated in the Design Guidelines of the Specific Plan, minimize shading of open space through articulation of building faces, setbacks, building separation, tower separation and setbacks, use of mansard or gable roofs, and reduced building heights. (p. VI.I.73)		X			Does not address a significant effect.
I.9	Include design factors to reduce wind speeds and turbulence such as: -Building setbacks along street frontages; -Articulation of the building facade and balconies or bay windows; and -Trellises, walls, large mature trees, and other elements to break up wind flows through mid-block lanes and courtyards (p. VI.I.74)		X			Means of addressing wind conditions which are now addressed in Measure I.10, Table 6.
J.6	Leave the cut-basalt block pavement on King and Sixth Streets intact, or remove and reuse it for road or pathway material in other Mission Bay locations, or remove and reuse it in other parts of the City. (p. VI.J.26)		X		X	Basalt blocks removed for MUNI light rail and new I-280 ramps

(continued)

TABLE 7 (cont.)
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
K.1	For structures of three stories or greater, conduct a comprehensive boring, sampling, and testing program to determine the engineering properties of the soil as required by the building permit process. (p. VI.K.45)	X				Measures now are incorporated in the San Francisco Building Code. ¹
K.2	Use pile-supported foundations (or other comparable foundations) wherever engineering practices and soil reports indicate that they are needed. (p. VI.K.45)	X				Measures now are incorporated in the San Francisco Building Code. ²
K.2c	Design flexible connections for utilities serving pile-supported buildings to accommodate the settlement expected in the surrounding soil. (p. VI.K.47)	X				Measures now are incorporated in the San Francisco Building Code. ³
K.5	Use surcharging and vertical drains to accelerate settlement if site-specific soils studies indicate need. (p. VI.K.48)				X	Current project design eliminates need for surcharging.

(continued)

1. City and County of San Francisco Municipal Code, *Building Code*, adopted 14 December 1995, §1804 and §1807.
2. City and County of San Francisco Municipal Code, *Building Code*, adopted 14 December 1995, §1804 and §1807.
3. City and County of San Francisco Municipal Code, *Building Code*, adopted 14 December 1995, §1804 and §1807.

TABLE 7 (cont.)
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
K.5a	Cover, coat, or seed the bare dirt to protect it from wind and rainfall. (p. VI.K.49)	X				Required by 1995 San Francisco Building Code.
K.5b	Where feasible, use soil excavated from other parts of the Project Area for surcharging to minimize the transport of soil. (p. VI.K.49)				X	Current project design eliminates need for surcharging.
K.6	To the extent urban design priorities would allow, keep basements above the water table so that dewatering would not be required. Construct project streets at or above existing grades to reduce the amount of excavation and the potential to encounter groundwater. (p. VI.K.49)		X			Does not address a significant effect.
M.1	Provide large blocks and wide strips of open space and parklands to maximize their value to wildlife, as included in Variant 12. (p. VI.M.21)		X			Does not address a significant effect.
M.2	Establish vegetation as soon as feasible after construction. (p. VI.M.21)		X			Does not address a significant effect.
M.3	Plant fruit, nut and berry producing trees and shrubs in open space areas to increase the primary productivity of the site, providing food for birds. (p. VI.M.21)		X			Does not address a significant effect.

(continued)

TABLE 7 (cont.)
1990 FEIR MEASURES NOT PROPOSED FOR THE CURRENT SEIR PROJECT

SUMMARIES OF 1990 MISSION BAY FEIR MITIGATION MEASURES RELATED TO TOPICS TO BE FOCUSED OUT OF THE SUBSEQUENT EIR UPDATED LANGUAGE IS SHOWN IN ITALICS		Measure Addressed by or Incorporated in Existing Regulations	Improvement Measure to Reduce Less-Than-Significant Impact	Measure Included as Part of the SEIR Project	Not Applicable to SEIR Project	Comments
M.3a	To the maximum extent practicable, use organic controls on pests and weeds in landscaping. Prepare a list of chemical pesticides and herbicides to be avoided by park personnel and property owners in Mission Bay. (p. VI.M.21)		X			Does not address a significant effect.
M.4	Plant foliage buffers between open space areas and roadways and areas of high human activity. (p. VI.M.22)		X			Does not address a significant effect.

E. MANDATORY FINDINGS OF SIGNIFICANCE

	<u>Yes</u>	<u>No</u>	<u>Discussed Below</u>	<u>To be Analyzed In SEIR</u>
*1. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or pre-history?	<u>X</u>	___	___	<u>X</u>
*2. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	<u>X</u>	___	___	<u>X</u>
*3. Does the project have possible environmental effects which are individually limited, but cumulatively considerable? (Analyze in the light of past projects, other current projects, and probable future projects.)	<u>X</u>	___	___	<u>X</u>
*4. Would the project cause substantial adverse effects on human beings, either directly or indirectly?	<u>X</u>	___	___	<u>X</u>

* Derived from State EIR Guidelines, Appendix G, normally significant effect.

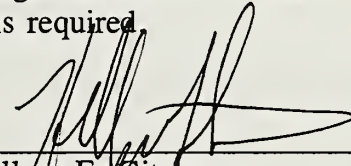
The proposed land use development program could have a number of potentially significant environmental effects in issue areas including: land use, visual quality, transportation, noise, air quality, community facilities and infrastructure, vegetation and wildlife, seismic and inundation hazards, water quality, hazardous materials and hazardous wastes. The SEIR will


consider these issues as well as whether the project could affect the balance of jobs and housing or induce growth outside the Project Area.

F. ON THE BASIS OF THIS INITIAL STUDY:

- ___ I find the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared by the Department of City Planning.
- ___ I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because the mitigation measures, numbers ___, in the discussion have been included as part of the proposed project. A NEGATIVE DECLARATION will be prepared.
- X I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

9/12/97
Date


Hillary E. Gitelman
Environmental Review Officer
for
Gerald G. Green
Director of Planning


Stanley Muraoka
EIR Program Administrator
San Francisco Redevelopment Agency

B. PLANS, POLICIES, AND PERMITS

PROPOSED GENERAL PLAN AMENDMENTS

The following pages contain the proposed amendments to the *San Francisco General Plan* (General Plan) as developed by the Planning Department./1/ These amendments would be necessary to create consistency between the proposed project and the policies presented in the General Plan. The “Mission Bay Area” would be graphically delineated to correspond with the overall boundaries of the proposed Mission Bay North Redevelopment Area and the Mission Bay South Redevelopment Area. Please note that additions to the text of the General Plan are noted by **bold double underlined text** and deletions are noted by ~~strike-out text~~. Minor modifications and refinements to the following list are expected as the project proceeds through its various public meetings, hearings, and approval processes.

Residence Element

Page I.1.9; Table 59 entitled “Potential Residential and Population Density by Zoning Districts”

Amendments include:

1. Under the second column, “Zoning Districts,” in the second row (“Moderately Low Density”), delete the reference to the “MB-R-1” zoning district.
2. Under the second column, “Zoning Districts,” in the third row (“Medium Density”), delete the reference to the “MB-R-2” zoning district.
3. Under the second column, “Zoning Districts,” in the fourth row (“Moderately High Density”), delete the reference to the “MB-R-3” zoning district.
4. Under the fifth column, “General Locations,” in the second row, delete the reference to Mission Bay. The new text (with deletions noted by strike-out text) is as follows:
“Appropriate in the central hills area, along Diamond Heights, Twin Peaks, and Potrero Hill, around Golden Gate Park in the Richmond, and northern part of the Sunset districts and in the Marina district ~~and the edges of Mission Bay bordering open-space areas.~~”
5. Under the fifth column, “General Locations,” in the third row, delete the reference to Mission Bay. The new text (with deletions noted by strike-out text) is as follows:
“Appropriate for nonresidential commercial and industrial districts, and certain areas adjacent to the commercial zones ~~and the central area in Mission Bay.~~”
6. Under the fifth column, “General Locations,” in the fourth row, amend the references

to Mission Bay as indicated below (with deletions noted by strike-out text and additions noted by bold, double underlined text):

“Appropriate for the more intensively developed north-eastern part of the city, for major transit corridors such as Van Ness Avenue, Upper Market Street and Columbus Avenue, in major redevelopment areas such as the Western Addition ~~and~~, Golden Gateway ~~and Mission Bay~~ areas, in Nob Hill, Chinatown, and North Beach, ~~and the edges of Mission Bay bordering commercial and industrial areas.~~ **In the Mission Bay North Redevelopment Project Area, residential densities of up to 250 persons per gross residential acre would be appropriate and in the Mission Bay South Redevelopment Project Area, residential densities of up to 275 persons per gross residential acre would be appropriate.**”

Page I.1.11; Map 3 entitled “Residential Density Plan”

Amend the designation for the Mission Bay area from “Medium Density (Average 54 Units Per Acre)” to a Circle designation with an asterisk in the circle which references, at the bottom of the page, the statement “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Commerce & Industry Element

Page I.2.5; Map 1 entitled “Generalized Commercial and Industrial Land Use Plan”

Add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.2.6; Map 2 entitled “Generalized Commercial and Industrial Density Plan (Excludes Neighborhood Commercial Areas)”

Add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.2.31; Map 4 entitled “Residential Service Areas of Neighborhood Commercial Districts and Uses”

Delete the shading from the Mission Bay area and add a circle around said area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.2.33; Map 5 entitled “Generalized Neighborhood Commercial Land Use and Density Plan”

Add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Recreation and Open Space Element

Page I.3.11; Map 2 entitled “Public Open Space Service Areas”

Add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.3.18; Map 4 entitled “Citywide Recreation & Open Space Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.3.36; Map 8 entitled “Eastern Shoreline Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.3.37, Second column, third paragraph entitled “Mission Bay”

This paragraph is deleted in its entirety and replaced by the following text:

“The area known as Mission Bay is governed by the Mission Bay North and Mission Bay South Redevelopment Plans. The two Redevelopment Plans and their companion Design for Development Documents provide for a balanced program of active and passive recreational opportunities within strategically located open space sites throughout Mission Bay. They also provide that the open spaces within Mission Bay will seek to utilize and enhance the existing natural amenities of Mission Bay, such as the shoreline, China Basin Channel and public vistas.

“The concept for the open space system for Mission Bay is to provide opportunities for local, citywide and regional recreational usage. The intent is to develop: (1) flexible/multiple use spaces that can accommodate heavy, active recreational uses as well as a balance of active and passive uses; and (2) spaces that will accommodate the immediate as well as the long-term/changing needs of the local community and the City.”

Page I.3.45, Figure 3 entitled “Service Areas”

Remove the shading around the Mission Bay area.

Page I.3.47; Map 9 entitled “Neighborhood Recreation & Open Space Improvement Priority Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Transportation Element

Page I.4.28; Map 5 entitled “Signed Bikeways Plan”

Amend the area for Mission Bay to reflect the street grid and bicycle path network of the Mission Bay North and Mission Bay South Redevelopment Plans and Design for Development documents.

Page I.4.32; Map 6 entitled “Vehicular Street Map”

Amend the area for Mission Bay to reflect the street grid and street hierarchy of the Mission Bay North and Mission Bay South Redevelopment Plans and Design for Development documents.

Page I.4.34; Map 8 entitled “Metropolitan Transportation System (MTS): Streets and Highways”

Amend the area for Mission Bay to reflect the street grid and street hierarchy of the Mission Bay North and Mission Bay South Redevelopment Plans and Design for Development documents.

Page I.4.56; Map 12 entitled “Neighborhood Pedestrian Streets”

Amend the area for Mission Bay to reflect the street grid and pedestrian network of the Mission Bay North and Mission Bay South Redevelopment Plans and Design for Development documents.

Page I.4.59; Map 13 entitled “Bicycle Route Map”

Amend the area for Mission Bay to reflect the street grid and bicycle path network of the Mission Bay North and Mission Bay South Redevelopment Plans and Design for Development documents.

Urban Design Element

Page I.5.13; Map 2 entitled “Plan for Street Landscaping and Lighting”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and the Mission Bay South Redevelopment Plans.”

Page I.5.18; Map 3 entitled “Where Streets Are Most Important as Sources of Light, Air and Open Space”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page I.5.34; Map 4 entitled “Urban Design Guidelines for Height of Buildings”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment.”

Page I.5.35; Map 5 entitled “Urban Design Guidelines for Bulk of Buildings”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Arts Element

Page I.9.11; Map showing “Single Artists” concentration throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of single artist to a “low” concentration of single artists.

Page I.9.13; Map showing concentration of Literary Arts Centers throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of literary arts centers to a “low” concentration of literary arts centers.

Page I.9.20; Map showing concentrations of Motion Picture Theaters throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of motion picture theaters to a “medium” concentration of motion picture theaters.

Page I.9.20; Map showing concentrations of Recording Industry throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of recording industry to a “medium” concentration of recording industry.

Page I.9.21; Map showing concentrations of Commercial Arts Centers throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of commercial arts centers to a “medium” concentration of commercial arts centers.

Page I.9.23; Map showing concentrations of Commercial Theaters throughout the City

Amend the map to reflect, for the Mission Bay area, a change in the shading from a “very high” concentration of commercial theaters to a “medium” concentration of commercial theaters.

Downtown Plan

Page II.1.10, First Paragraph

Amend the second to last sentence as shown below (with deletions noted by strike-out text and additions noted by bold, double underlined text):

“Support commercial and secondary office demand can be absorbed in a number of locations: Market Street west of Fifth Street, portions of the south of Market ~~west~~ **southeast** of YBC, the Van Ness corridor, Second Street corridor south of the C-3 district, Jackson Square, and the northern waterfront. **A major new source of space for support commercial and secondary office may also be provided at Mission Bay.**”

Central Waterfront Plan

Page II.8.1, Paragraph entitled “Scope and Organization”

This paragraph is deleted in its entirety and replaced by the following text:

“The geographic area covered in the Central Waterfront Plan is comprised of a number of geographic sub-areas shown on Map 1. The Plan begins with introductory material covering the purpose of the Plan, relation to the General Plan and Background. The Plan also contains general objectives and policies for the Showplace Square, Central Basin, North Potrero, Islais Creek and Lower Potrero sub-areas followed by specific objectives and policies for each sub-area.

“The area designated as Mission was previously governed by a separately published sub-area plan, called the Mission Bay Plan, which was organized to qualify as a Specific Plan. The Mission Bay area has subsequently been designated as two separate Redevelopment Project Areas, Mission Bay North and Mission Bay South, and is governed by the Mission Bay North and Mission Bay South Redevelopment Plans, respectively. Please refer to those Plans, their accompanying Design for Development documents and related approval documents for sub-area-specific planning objectives, land use standards and design guidelines.”

Page II.8.3, Second column, first paragraph under “Description” in the “Background” section

This paragraph is deleted in its entirety and replaced by the following text:

“The Central Waterfront covers the eastern shoreline of San Francisco between China Basin and Islais Creek and adjacent inland areas, exclusive of the approximately 65 acres lying within the Mission Bay North Redevelopment Project Area and the approximately 238 acres lying within the Mission Bay South Redevelopment Project Area. The land covered by the Central Waterfront Plan totals approximately 600 acres.”

Page II.8.5, Second column, first paragraph (third paragraph under “Conditions and Trends (1990))”

This paragraph is deleted in its entirety and replaced by the following text:

“The entire Central Waterfront Plan area encompasses approximately 600 acres, which excludes the 303 acres covered by the approximately 65-acre Mission Bay North and approximately 238-acre Mission Bay South Redevelopment Project Areas. The 130 acres in Showplace Square is used primarily for apparel and interior design wholesale, storage and showroom facilities. Data collected from a 1987 land use inventory indicated 482 acres in the lower Potrero and waterfront areas of which 302 acres were in industrial use, 18 acres were vacant, 58 acres were in railroad easements under freeways and the remaining 108 acres were in a mix of uses.”

Page II.8.6, Second column, second paragraph

This paragraph is deleted in its entirety and replaced by the following text:

“Favorable economic trends are beginning to appear in the Central Waterfront. Healthy components of the local economy, including apparel manufacturing, interior design activities, multi-media publishing and medical research, are now undergoing expansion and future growth is anticipated. The prospect over 6,000 new dwelling units and over 5 million square feet of office, medical research, retail and other commercial space in the Mission Bay North and Mission Bay South Redevelopment Project Areas, as well as a UCSF campus within the Mission Bay South Redevelopment Project Area, signal the healthy redevelopment of the area. The resurgence of the primary and secondary office market, the construction of live/work units along Third Street and Lower Potrero and the proposed construction of the Third Street Light Rail Transit line bodes well for the economic and social revitalization of the neighborhood.”

Page II.8.13, Map 1 entitled “Central Waterfront Planning Area”

Add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page II.8.17, Second column last sentence that states “OBJECTIVES AND POLICIES - PART 2: SEE MISSION BAY PLAN”

This sentence is deleted in its entirety and replaced by the following text:

“OBJECTIVES AND POLICIES OF THE MISSION BAY AREA: SEE MISSION BAY NORTH REDEVELOPMENT PLAN AND MISSION BAY SOUTH REDEVELOPMENT PLAN”

Mission Bay Plan

The Mission Bay Plan was proposed to be rescinded in its entirety and replaced by the Mission Bay North Redevelopment Plan and the Mission Bay South Redevelopment Plan. However, several sites in the *Mission Bay Plan* would not be part of the proposed project and are not included in the Project Area: the blocks located between Townsend, King, Fourth, and Sixth Streets, which include the Caltrain terminal and tracks; Seawall Lot 337, located at the mouth of China Basin Channel and Third Street; and portions of Seawall Lots 338 and 339. For the Project Area, the Mission Bay Plan would no longer apply and the following would be inserted in substantially this form: “The Mission Bay North and Mission Bay South Redevelopment Plans govern the area shown as ‘Mission Bay Redevelopment Plan Areas’ on Map 1 entitled ‘Central Waterfront Planning Area’ on page II.8.13 of the Central Waterfront Plan.”

Land Use Index

Page III.1.3, Map entitled “Generalized Land Use Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.6, Map entitled “Generalized Commercial and Industrial Land Use Plan”

Amend the notation of the Mission Bay area that states “See CENTRAL WATERFRONT PLAN” by adding a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.15, Map entitled “City Recreation & Open Space Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.26, Map entitled “Generalized Commercial & Industrial Density Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.27, Map entitled “Residential Density Plan”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.29, Map entitled “Urban Design Guidelines for Height of Buildings”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

Page III.1.30, Map entitled “Urban Design Guidelines for Bulk of Buildings”

Delete the shaded areas within the Mission Bay area and add a circle around the Mission Bay area with a line that leads to a reference that states “See the Mission Bay North and Mission Bay South Redevelopment Plans.”

NOTES: Appendix B, Plans, Policies, and Permits

1. San Francisco Planning Department, *Mission Bay South Redevelopment Project Preliminary Plan*, October 16, 1997, pp. 12-19.

C. BUSINESS ACTIVITY, EMPLOYMENT, HOUSING, AND POPULATION

This appendix presents detailed tables that are summarized in Section V.C, Business Activity, Employment, Housing, and Population, as well as information on the methods for deriving the key estimates presented in that section. Table C.1 presents information on the distribution of existing Project Area jobs by occupation. Table C.2 contains employment projections from 1995 to 2015 for the rest of the region by main area, while Table C.3 shows the same data for population. Table C.4 identifies the residential location of people who have jobs in San Francisco, while Table C.5 presents data on where residents of San Francisco who are employed work within the region. Table C.6 presents the density factors and assumptions for estimating employment associated with Project Area development, while Table C.7 provides the same information for demographic factors used in estimating project population and employed residents. In addition, for informational purposes, this appendix compares the SEIR cumulative growth scenario with the Association of Bay Area Governments' (ABAG) *Projections '98* forecasts.

TABLE C.1
DISTRIBUTION OF EXISTING PROJECT AREA JOBS BY OCCUPATION

Occupation	Number of Jobs	Percent
Professional/Technical	94	6%
Managerial/Administrative	203	12%
Clerical	202	12%
Sales	260	16%
Service	88	5%
Skilled Crafts	110	7%
Operatives	573	34%
Other	140	8%
TOTAL	1,671	100%

Note:

Summary distribution of jobs by occupation created from detail by business activity. The detailed distributions are those from the 1990 FEIR; see Table VI.B.12, "Occupation and Wage/Salary Distribution for Jobs in Mission Bay, 1985," in Volume Two, p. VI.B.39.

Source: Hausrath Economics Group.

TABLE C.2
EMPLOYMENT IN THE REST OF THE REGION, 1995 AND 2015

Area of Region	Number			Percent of Total			Annual Growth Rate
	1995	2015	1995 - 2015	1995	2015	1995 - 2015	1995 - 2015
East Bay	1,079,080	1,541,540	462,460	43%	46%	52%	1.8%
South Bay	1,145,700	1,448,550	302,850	46%	43%	34%	1.2%
North Bay	268,900	393,020	124,120	11%	12%	14%	1.9%
Total Rest of Region Excluding San Francisco	2,493,680	3,383,110	889,430	100%	100%	100%	1.5%

Source: Association of Bay Area Governments, *Projections '96*, December 1995.

* * * *

TABLE C.3
POPULATION IN THE REST OF THE REGION, 1995 AND 2015

Area of Region	Number			Percent of Total			Annual Growth Rate
	1995	2015	1995 - 2015	1995	2015	1995 - 2015	1995 - 2015
East Bay	2,744,800	3,445,100	700,300	48%	50%	59%	1.1%
South Bay	2,307,650	2,636,000	328,350	40%	38%	27%	0.7%
North Bay	677,600	844,050	166,450	12%	12%	14%	1.1%
Total Rest of Region Excluding San Francisco	5,730,050	6,925,150	1,195,100	100%	100%	100%	1.0%

Source: Association of Bay Area Governments, *Projections '96*, December 1995.

TABLE C.4
PLACE OF RESIDENCE FOR PEOPLE WORKING IN SAN FRANCISCO

Place of Residence	Percent Distribution by Place of Residence				
	1960	1970	1980	1990	2010
<i>San Francisco</i>	72.5%	62.6%	55.9%	55.3%	55.1%
East Bay	8.1%	12.7%	18.5%	21.5%	23.3%
South Bay	14.9%	17.0%	16.9%	15.6%	14.4%
North Bay	4.5%	7.7%	8.7%	7.6%	7.2%
<i>Subtotal Rest of Region</i>	27.5%	37.4%	44.1%	44.7%	44.9%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%

Note:

The percent distribution of workers does not include workers who live outside the nine-county Bay Area. In 1990, there were about 12,000 people working in the City who lived outside the region; they accounted for about 2% of all San Francisco jobs.

Source: Metropolitan Transportation Commission, "County-to-County Commuters in the San Francisco Bay Area: 1960-2010" (based on U.S. Decennial Census and ABAG *Projections '96*; commuter forecasts prepared by MTC); Hausrath Economics Group.

* * * *

TABLE C.5
PLACE OF WORK FOR EMPLOYED RESIDENTS OF SAN FRANCISCO

Place of Work	Percent Distribution by Place of Work				
	1960	1970	1980	1990	2010
<i>San Francisco</i>	93.6%	89.7%	85.9%	81.1%	78.9%
East Bay	2.0%	3.0%	5.4%	6.7%	7.2%
South Bay	3.8%	6.8%	7.6%	10.7%	12.2%
North Bay	0.6%	0.5%	1.1%	1.5%	1.7%
<i>Subtotal Rest of Region</i>	6.4%	10.3%	14.1%	18.9%	21.1%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%

Note:

The percent distribution of employed residents does not include those who work outside the nine-county Bay Area. In 1990, there were about 3,300 people living in the City who worked outside the region; they accounted for less than 1% of all San Francisco employed residents.

Source: Metropolitan Transportation Commission, "County-to-County Commuters in the San Francisco Bay Area: 1960-2010" (based on U.S. Decennial Census and ABAG *Projections '96*; commuter forecasts prepared by MTC); Hausrath Economics Group.

TABLE C.6
DENSITY FACTORS AND ASSUMPTIONS FOR ESTIMATING EMPLOYMENT FOR THE PROPOSED PROJECT

Business Activity/Employment Category	Density Factor /a/	Comments
Office	300 gross sq. ft. occupied space per employee	Reflects a less intensive use of space in lower-rise office development than would be the case in downtown San Francisco office development (typically estimated at 275 gross sq. ft. of occupied space per employee). This is the same office employment density factor used in the 1990 FEIR variant analysis of office as a primary use in Service/Light Industrial/Research & Development space (Variant 7). A 5% vacancy rate is assumed. The employment density factor that incorporates the vacancy is 316 gross sq. ft. of total space per employee.
Research and Development	405 gross sq. ft. occupied space per employee	This is the same employment density factor used in the 1990 FEIR analysis of Service/Light Industrial/Research & Development (SLIRD) space for Alternative A in the 1990 FEIR. It reflects a mix of business activities including research and development, light manufacturing, small warehouse and distribution operations, and commercial services. A 5% vacancy rate is assumed. The employment density factor that incorporates the vacancy is 426 gross sq. ft. of total space per employee.
UCSF Site	Not applicable	Employment estimate for UCSF (9,100 jobs) from University of California San Francisco, <i>1996 Long Range Development Plan Final Environmental Impact Report</i> , State Clearinghouse No. 95123032, January 1997, Volume II, p. 516.
Retail	350 gross sq. ft. per employee	Reflects the mix of retail shops and restaurants and bars typical of retail space in office buildings and, generally, of retail development outside the primary retail district, including stand-alone, city-serving retail outlets.
Entertainment-Oriented Commercial Hotel	350 gross sq. ft. per employee	Reflects the mix of retail shops and restaurants and bars typical of retail space in office buildings.
Hotel	0.74 employee per room	Includes hotel management and housekeeping functions, as well as retail shops and restaurants and bars in hotels. This employment density factor reflects the level of service of downtown hotels.
Community Facilities	777 gross sq. ft. per employee	C-3 District Employer Survey, 1981, and South of Market/Folsom Employer Survey, 1982.
Open Space	1 employee per 10 acres	Major open space land area only (not including open space associated with other uses). Accounts for gardening and landscape maintenance jobs, not staffing for active recreation.
Building Maintenance/Security	40 employees per 500,000 gross sq. ft.	Applied to total of office, research and development, and retail space. Includes outdoor maintenance and landscaping. Building maintenance and security for UCSF assumed to be included in employment estimate for the site.
Structured Parking	1 employee per 80 spaces	C-3 District Employer Survey, 1981, and South of Market/Folsom Employer Survey, 1982.
Housing-related	2 employees per 50 dwelling units	Accounts for management, security, and maintenance personnel.

Note: a. The density factors account for both full-time and part-time workers.

Source: Hausrath Economics Group.

TABLE C.7
DEMOGRAPHIC FACTORS FOR THE PROPOSED MISSION BAY PROJECT

Persons-per-Household by Unit Size

Unit Size	Market-Rate Units	Affordable Units	Comments
Studio	1.05	1.1	Gabriel-Roche, Inc. and Hausrath Economics Group background analyses for 1990 FEIR.
1 Bedroom	1.35	1.6	
2 Bedrooms	1.8	2.5	
3 Bedrooms	2.6	3.7	

Age Distribution of the Population in 2015

Age Category	Percent of Population	Comments
Less than 15 years	16%	From 1990 FEIR, p. XIV.A.13, confirmed against ABAG demographic projections for San Francisco, presented in <i>Projections '96</i> .
15-64 years	69%	
65 years and over	15%	
TOTAL	100%	

Employed Residents by Age in 2015

Age Category	Percent of Population in Age Category That Would Be Employed	Comments
15-64 years	82%	Hausrath Economics Group background analyses for 1990 FEIR (see 1990 FEIR, p. XIV.A.13).
65-74 years /a/	50%	
Result: 60.4% of total population would be employed and 71.8% of population 15 years of age and older would be employed.		This is higher than the ABAG projected citywide average (62.5% of the population 15 years of age and older would be employed in 2015). It is reasonable to expect that a higher percentage of the Mission Bay population would be employed compared to the percentage for the City as a whole.

Note:

a. Assuming 50% of the population 65 years and older would be in the 65-74 year age category.

Source: Hausrath Economics Group.

EXISTING PROJECT AREA

Establishments and Employment

The 1990 FEIR identified 114 establishments and just over 2,000 people working in the Project Area.^{1/} In 1997, counts were lower (94 establishments and 1,671 persons employed), but not because of a decline in the level of activity. Indeed, compared to the situation 10 years ago, there now appears to be a higher level of business activity and more formal and established space use, particularly in the western portions of the Project Area. There are two reasons for fewer establishments and less employment in the 1997 survey: a different project area boundary and the approximate nature of the data-gathering process. The earlier project area boundary included the Caltrain terminal and associated land area along Townsend Street. That establishment alone accounted for about 150 jobs in the 1990 FEIR project area totals. The earlier project area boundary also included more port property than does the current boundary; the port-owned land, buildings, and associated business activity east of Third Street and north of Mission Rock Street are not included in the current Mission Bay Project Area. The activity at the properties added to the Project Area within the new boundary at Third Street and Mariposa Street is not currently of the scale to offset the loss of those areas no longer included.

Most important, the Project Area business survey is not a complete census of establishments and employment. A few establishments may have been missed in the field work, and some identified establishments did not respond to interviewers' questions about use of space and number of employees. Nonetheless, the current numbers are valid and confirm, by comparison to estimates of 10 years ago, that the function of the Mission Bay Project Area as a business location in San Francisco has remained fairly constant over the last decade.

Rail Freight Users

None of the business establishments interviewed for the 1997 business survey use rail transportation at this location in the Project Area. One office establishment (a long-time Project Area business) is a third-party provider of transportation services. As such, the office makes arrangements for rail transportation for various cargoes through the Port of San Francisco. The project area business survey conducted for the 1990 FEIR identified 13 rail-freight users (11% of all Project Area establishments).^{2/}

Maritime-Related Activity

The extent to which Project Area businesses depend directly on cargo movement through maritime facilities has declined over time. Thirteen of the respondents to the business survey conducted for this SEIR indicated that they depend on water-borne transportation, either because the establishment is part of the intermodal transportation network or because the establishment receives raw materials and/or ships products through port facilities. The project area business survey conducted for the 1990 FEIR identified 39 project area business establishments as "maritime-related."/^{3/} Only four of the current establishments use Port of San Francisco facilities (and only one of them uses those facilities exclusively). All the rest use the Port of Oakland, and one uses the Port of Redwood City. Some establishments view the Mission Bay Project Area location as convenient to Port of Oakland facilities. For others, proximity to a port's facilities is not an important location factor.

BACKGROUND ON THE JOBS/HOUSING ANALYSIS

Analysis of the jobs/housing relationship for the Project Area follows the approach outlined in the recent consultants' report updating the formula for the City's Office-Affordable Housing Production Program (OAHPP)./^{4/} That approach builds on the original OAHPP analysis that was the basis for the jobs/housing analysis of the alternatives in the 1990 FEIR.^{5/} Consequently, the assessment below (see Table C.8) represents an evolution of the jobs/housing analysis for San Francisco, reflecting updated demographic projections for the City and updated regional projections as presented in *ABAG Projections '96*, as well as the most current MTC commute patterns projections based on data in *Projections '96*./^{6/}

As in the 1990 FEIR, the jobs/housing analysis starts with employment growth in the Project Area and, through a series of calculations, develops an estimate of the increase in households in San Francisco associated with additional Project Area jobs. That estimate, a measure of the demand for housing in San Francisco associated with Project Area employment growth, is compared to the supply represented by Project Area housing development. The comparison indicates whether development of the Project Area considered as a whole adds more to the demand side of the City's housing market equation (by accommodating business activity and jobs) or more to the supply side (by providing new housing units).

TABLE C.8
JOBS/HOUSING ANALYSIS FOR THE PROPOSED PROJECT

Demand	[Formulae]	With UCSF	Without UCSF/a/
A. Employment growth accommodated in Mission Bay/b/		28,330	19,230
B. Percent representing additional workers living in San Francisco/c/		55.0%	55.0%
C. Average number of San Francisco workers in households with workers/d/		1.6	1.6
D. Additional households associated with Project Area employment growth	[(A*B)/C]	9,738	6,610
Supply			
E. Total Project Area Housing Units		6,090	6,090
Comparison of Supply to Demand			
Surplus or (Deficit) in Project Area	[E-D]	(3,648)	(520)

Notes:

This jobs/housing comparison is not meant to imply that there should (or ever would) be a precise match between the two for any given project. The calculation is a useful means of evaluating the proposed project, and it provides an indication of the longer-term implications of the land use mix for the City's housing market.

- a. UCSF addressed the issue of housing need for students, faculty and staff in the *1996 Long Range Development Plan*. The LRDP EIR discusses housing demand from students, faculty, and employees. See University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, State Clearinghouse No. 95123032, January 1997, Volume II, pp.515-517.
- b. Total Project Area employment at build-out (30,000 jobs) minus existing Project Area employment (1,670 jobs), and, for the "without UCSF" case, minus UCSF jobs (9,100 jobs).
- c. Keyser Marston Associates, Inc. and Gabriel Roche, Inc., *Jobs Housing Nexus Analysis, City of San Francisco*, July 1997, pp. 51-52.
- d. Keyser Marston Associates, Inc. and Gabriel Roche, Inc., *Jobs Housing Nexus Analysis, City of San Francisco*, July 1997, pp. 49-50.

Source: Hausrath Economics Group.

SEIR CUMULATIVE GROWTH SCENARIO COMPARED TO *PROJECTIONS* '98

ABAG published *Projections* '98 in December 1997, after the analysis for this SEIR and most of the writing had been completed. What follows is a brief discussion of how the growth scenario used in the SEIR compares to ABAG's most recent projections. Table C.9 presents total San Francisco employment, households, and population projections as prepared for the San Francisco cumulative growth scenario (the basis for the cumulative analyses in this SEIR and several other environmental analyses currently under preparation in the City)/7/, side by side with the new projections published by ABAG. The projections of cumulative growth used in this SEIR (build-out of the Mission Bay Project Area by 2015 plus growth in the rest of the City as projected in the San Francisco cumulative growth scenario) remain valid for the purposes of the SEIR. As described below, the SEIR cumulative projections show more employment and population growth in San Francisco by 2015; they are therefore appropriately conservative for environmental impact analysis.

The employment projections to 2015 are almost the same, reflecting a substantial revision in ABAG's assessment of the employment growth outlook for San Francisco. In *Projections* '98, ABAG projects only 1,400 fewer jobs in San Francisco by 2015 than does the San Francisco cumulative growth scenario. The San Francisco cumulative growth scenario numbers shown in Table C.9 were modified for use in this SEIR to reflect full build-out of the Mission Bay Project Area. That total for employment in 2015 in San Francisco is 673,495 (see Table V.C.8). In *Projections* '98, ABAG's 2020 employment projection for San Francisco is 679,650, an estimate that would accommodate build-out of the Project Area.

There are differences between the two sets of projections of households, population, and employed residents. ABAG projects growth of housing in San Francisco, though at a slower rate than does the San Francisco cumulative growth scenario (about 1,265 units per year for ABAG and 1,600 units per year for the San Francisco cumulative growth scenario). Furthermore, population continues to increase under the San Francisco cumulative growth scenario while ABAG shows population decline in the City after a peak at 806,200 in 2010. According to ABAG, population is expected to decline because of demographic patterns, particularly the aging of the population, resulting in smaller average household sizes for existing as well as new housing units. This pattern is not evident in the San Francisco cumulative growth scenario projections./8/

Finally, the number of residents of the City who are employed continues to grow in both sets of projections. In *Projections* '98, the employed population increases while total population declines; there are more workers per household on average over time and a larger share of the population is in

TABLE C.9
COMPARISON OF ABAG PROJECTIONS '98 TO SAN FRANCISCO CUMULATIVE GROWTH SCENARIO

	San Francisco Cumulative Growth Scenario /a/,/b/		ABAG Projections '98 /c/		
	1995	2015	1995	2015	2020
Employment	534,600	665,300	534,610	663,900	679,500
Households	311,430	343,622	309,620	334,930	337,340
Population	759,900	819,500	751,700	801,400	793,400
Employed Residents	376,800	428,030	379,800	463,100	473,000

Notes:

- a. San Francisco totals without adjustment for build-out of the Mission Bay Project Area. See Table V.C.8 and Table V.C.9 for the total San Francisco numbers analyzed in this SEIR (Project Area build-out plus "Rest of City" subtotals from the San Francisco Cumulative Growth Scenario prepared by Keyser Marston Associates.)
- b. Keyser Marston Associates, Inc., *San Francisco Cumulative Growth Scenario, Final Technical Memorandum*, prepared for the San Francisco Redevelopment Agency, March 30, 1998.
- c. Association of Bay Area Governments, *Projections '98*, December 1997.

Source: Hausrath Economics Group.

the labor force and employed./9/ By contrast, under the San Francisco cumulative growth scenario, the average number of workers per household and the relationship between employed residents and total population remains relatively constant through the projection period.

NOTES: Appendix C, Business Activity, Employment, Housing, and Population

1. San Francisco Planning Department, *Mission Bay Final Environmental Impact Report*, Planning Department File No. 86505E, State Clearinghouse No. 86070113, August 23, 1990, Volume Two, Table VI.B.5, p. VI.B.10.
2. 1990 FEIR, Volume Two, pp. VI.B.8-IV.B.9.
3. 1990 FEIR, Volume Two, pp. VI.B.9-VI.B.11.
4. Keyser Marston Associates, Inc. and Gabriel Roche Inc., *Jobs Housing Nexus Analysis, City of San Francisco*, July 1997.

C. Business Activity, Employment, Housing, and Population

5. 1990 FEIR, Volume Two, pp. VI.C.67-VI.C.77, and Volume Three, Appendix C, pp. XIV.C.29-XIV.C.36.
6. Association of Bay Area Governments, *Projections '96*, December 1995. Appendix Table C.4 presents commute patterns projections.
7. Keyser Marston Associates, Inc., *San Francisco Cumulative Growth Scenario, Final Technical Memorandum*, prepared for the San Francisco Redevelopment Agency, March 30, 1998.
8. This same pattern was evident in *Projections '96*—declining population in San Francisco after a peak in 2010.
9. The increase in workers per household over time is a substantial difference between *Projections '98* and *Projections '96* for San Francisco. In *Projections '96*, ABAG forecast that the average number of workers per household would hold steady through the year 2015.

D. TRANSPORTATION

ROADWAY SYSTEM

Existing Streets

The following provides a description of the existing roadway system in and near the proposed Mission Bay Project Area.

King Street

King Street has been reconstructed between The Embarcadero and Third Street, in preparation for future service as the primary connection between I-280 and The Embarcadero. There are two travel lanes in each direction with parking permitted in the curb lane in most areas in both directions. King Street between Third and Fourth Streets was opened to traffic in the summer of 1997. The Fourth to Fifth Streets section was opened to traffic in conjunction with the opening of the I-280 on-ramp in late November 1997. Starting January 1998, MUNI Metro light-rail service will be provided in the median of King Street with stations at Second Street and Fourth Street. King Street is designated as a major arterial, a transit important street, a neighborhood pedestrian street and a citywide bicycle route in the Transportation Element of the City's General Plan (see Table D.1 for definitions of street designations). It is also part of the County Congestion Management Program (CMP) network and the federally designated Metropolitan Transportation System.

Townsend Street

Townsend Street serves primarily industrial and service commercial type uses west of Second Street and a residential area in the block between Colin P. Kelly Street and The Embarcadero. West of Third Street, Townsend Street is designated as a citywide bicycle route in the City's Transportation Element. It carries two-way traffic in an east-west direction with four travel lanes provided between Second and Fourth Streets and two lanes elsewhere. On-street parking is permitted with diagonal and also perpendicular parking provided in the residential area near The Embarcadero and near the Caltrain terminal between Fourth and Seventh Streets.

Brannan Street

Located three blocks north of Mission Bay, Brannan Street serves a mix of low-rise office, industrial and service commercial uses west of Delancey Street and a residential/retail area in the block between

TABLE D.1
VEHICULAR NETWORK CLASSIFICATION DEFINITIONS

Freeways - Limited access, very high capacity facilities; primary function is to carry intercity traffic; they may, as a result of route location, also serve the secondary function of providing for travel between distant sections of the city.

Major Arterials - Cross-town thoroughfares whose primary function is to link districts within the city and to distribute traffic from and to the freeways; these are routes generally of citywide significance; of carrying capacity depending on the travel demand for the specific direction and adjacent land uses.

Transit Conflict Streets - Streets with a primary transit function which are not classified as major arterials but experience significant conflicts with automobile traffic.

Secondary Arterials - Primarily intra-district routes of varying capacity serving as collectors for the major thoroughfares; in some cases supplemental to the major arterial system.

Recreational Street - A special category of street whose major function is to provide for slow pleasure drives and cyclist and pedestrian use; more highly valued for recreational use than for traffic movement. The order of priority for these streets should be to accommodate: 1) pedestrians, hiking trails or wilderness routes, as appropriate; 2) cyclists; 3) equestrians; 4) automobile scenic driving. This should be slow and consistent with the topography and nature of the area. There should be adequate parking outside of natural areas.

Collector Streets - Relatively low-capacity streets serving local distribution functions primarily in large, low-density areas, connecting to major and secondary arterials. To be identified in area plans.

Local Streets - All other streets intended for access to abutting residential and other land uses, rather than for through traffic; generally of lowest capacity.

Congestion Management (CMP) Network - The network of freeways, state highways and major arterials established in accordance with state Congestion Management legislation. Transit Conflict Streets are included in this network as well.

Metropolitan Transportation System (MTS) Streets, Highways and Freight Network - A regional network for San Francisco of freeways, major and secondary arterials, transit conflict and recreational streets meeting nine criteria developed by the Metropolitan Transportation Commission as part of the Regional Transportation Plan. The criteria identify facilities that provide relief to congested corridors, improve connectivity, accommodate travel demand and serve a regional transportation function. Due to the specific nature of the criteria, the MTS street and highway network is generally consistent with, but not identical to, the CMP network.

Relationship Between Function and Physical Design - No rigid design standards can be established on the basis of the functional categories established above, although higher capacities will generally be associated with freeways and major arterials. Capacities must be determined on the basis of the level of traffic demand, the space available for traffic and the nature of the surrounding environment.

Source: City and County of San Francisco, *San Francisco General Plan*, Transportation Element, Table 1, p. I.4.35.

Delancey Street and The Embarcadero. The block between Fifth and Sixth Streets is part of the San Francisco County Congestion Management (CMP) network, a section that is also designated as a major arterial in the Transportation Element. Brannan Street carries two-way traffic in an east-west direction with four travel lanes west of Second Street and two lanes in the residential area between Delancey Street and The Embarcadero. Brannan Street provides on-street, diagonal parking in the residential area. It also provides access to I-280 via on- and off-ramps at the intersection of Sixth and Brannan Streets. MUNI bus routes 15 and 42 use portions of Brannan Street.

Bryant Street

Located two blocks (a seven-minute walk) north of the Project Area, Bryant Street serves primarily retail commercial/residential-oriented uses west of Sterling Street and a residential area between Second Street and The Embarcadero. Bryant Street is designated as a major arterial, a transit important street between Third and Seventh Streets, and a secondary transit street between Seventh and Eleventh Streets in the City's Transportation Element. It is also part of the County Congestion Management Program network and the federally designated Metropolitan Transportation System. There are three distinct segments of Bryant Street with key differences in traffic flow, as summarized below:

West of Sterling Street:

- One-way eastbound
- Four basic through lanes
- Parking both sides

Sterling to Beale Street:

- Two-way (high-occupancy vehicle [HOV] restriction westbound weekdays 3:30 to 7:00 p.m.)
- Two lanes
- Parking south side only

Beale Street to The Embarcadero:

- Two-way (no HOV restriction)
- Two basic through lanes
- Parking north side only

Bryant Street provides access to eastbound I-80/Bay Bridge via on-ramps at Fifth and Sterling Streets. Off-ramps from eastbound I-80 are provided at Seventh and Fourth Streets. In many respects, Bryant Street serves a frontage-road function for eastbound I-80, collecting and distributing traffic between the freeway and local roadway network.

Harrison Street

Harrison Street is located on the other side of the I-80/Bay Bridge "skyway" from Bryant Street, more than one-half mile north of the Project Area. Harrison Street serves a mix of low- and mid-rise office, retail and residential buildings. It is designated as a major arterial, a transit important street between Fourth and Seventh Streets, and a secondary transit street between Seventh and Eleventh Streets in the City's Transportation Element. It is also part of the County Congestion Management Program network and the federally designated Metropolitan Transportation System. Harrison Street carries two-way traffic between Third Street and The Embarcadero, but is one-way westbound west of Third Street./1/ Four travel lanes are provided. Parking is permitted on both sides of Harrison Street. Harrison Street provides access to and from both directions of I-80 via the following ramps:

Eastbound I-80 Bridge On-Ramps:

- First Street
- Essex Street

Westbound I-80 On-Ramps:

- Fourth Street
- Seventh Street
- Eighth Street

Westbound I-80 Off-Ramps:

- Fremont Street
- Fifth Street

Harrison Street serves a frontage-road function for westbound I-80, collecting and distributing traffic between the freeway and local roadway network. It also serves as a feeder route for downtown and South Beach traffic destined for eastbound I-80/Bay Bridge.

16th Street

Sixteenth Street extends in an east-west direction between Illinois Street and outer Market Street, connecting the project site with the Mission District and upper Market Street and Potrero Hill areas. Sixteenth Street is designated as a secondary arterial, a transit-oriented street, a neighborhood pedestrian street, and a bicycle route in the City's Transportation Element. It provides two-way traffic flow, with four travel lanes east of, and two lanes west of Pennsylvania Street. On-street parking is permitted west of Pennsylvania Street.

Mariposa Street

Mariposa Street extends from the northbound U.S. 101 off-ramp at Vermont Street past Third Street to the waterfront at China Basin Street. Mariposa Street serves primarily residential uses west of Mississippi Street. Mariposa Street is a two-way east-west street with four travel lanes east of I-280 and two travel lanes west of the freeway interchange. Access to and from the south on I-280 is provided via on-ramps and off-ramps at Mariposa Street. The intersection at the off-ramp is signalized; the on-ramp is stop sign controlled. Parking is permitted on both the eastbound and westbound side of Mariposa Street west of Mississippi Street. Mariposa Street is a signed bike route from Mississippi to Third Streets.

The Embarcadero

The Embarcadero follows the waterfront from King Street north to Fisherman's Wharf. It is being reconstructed as a landscaped expressway having at least two travel lanes in each direction, a semi-exclusive transit right-of-way in the median, bicycle lanes and separated access and loading areas at piers in maritime use. The Embarcadero has two travel lanes in each direction from King Street to Folsom Street. Curb parking is provided in some areas. Final design plans are being prepared for the Mid-Embarcadero improvements between Folsom Street and Broadway. The Embarcadero is designated as a major arterial and a transit important street in the City's Transportation Element. It is part of the County Congestion Management Program network and the federally-designated Metropolitan Transportation System. The Embarcadero is an access route from the Golden Gate Bridge via both Broadway and Bay Streets, routes used to access the Project Area from the North Bay.

Second Street

Beginning at Berry Street, Second Street extends north to Market Street, a distance of approximately one mile. The existing Transbay Transit Terminal is located one block east of the intersection of

Mission and Second Streets. Second Street near the Mission Bay Project Area serves primarily low-rise buildings containing a mix of retail, residential, and service commercial uses. Second Street is designated as a citywide bicycle route in the City's Transportation Element. Second Street provides four travel lanes for two-way traffic. Parking is permitted on both sides of Second Street. Second Street is an access route to eastbound I-80/Bay Bridge via the on-ramp at Bryant/Sterling Streets (restricted to HOVs from 3:00 to 7:00 p.m. weekdays) and the on-ramp at Harrison/Essex Streets. The section of Second Street between Berry and King Streets was closed to vehicular and pedestrian traffic in November 1997 for construction of the San Francisco Giants Ballpark and it will be eliminated as part of that project.

Third Street

From the China Basin Channel, near Berry Street, Third Street extends north to Market Street a distance of one mile. The Montgomery BART station is located on Market Street one block east of the intersection of Market and Third Streets. Third Street north of China Basin Channel serves primarily low-rise buildings containing a mix of retail, residential and service commercial uses. Extending south, Third Street crosses China Basin Channel with a four-lane historic bascule (lift) bridge known as the Lefty O'Doul Bridge to serve the industrial uses south of the Channel in the Project Area. South of Mariposa Street, Third Street continues south for approximately four miles through the Bayview/Hunters Point area to an interchange with U.S. 101.

Third Street is designated as a major arterial and a transit important street, and part of the designated citywide pedestrian network north of Folsom Street in the City's Transportation Element. It is part of the County Congestion Management Program network and the federally designated Metropolitan Transportation System. Third Street north of China Basin Channel is a one-way northbound roadway providing four travel lanes plus parking on both sides. South of the Channel, Third Street is a four-lane two-way street; there are parking lanes on both sides. Third Street provides access to U.S. 101 approximately four miles south of the China Basin Channel. MUNI routes 30, 45, and 15 use Third Street northbound from Townsend Street; route 15 travels on Third Street south of the present intersection with Fourth Street.

Fourth Street

Fourth Street extends from Third Street south of China Basin Channel north to Market Street, including a historic three-lane bascule (lift) bridge over the Channel, known as the Peter Maloney Bridge. Fourth Street near the Project Area serves primarily low-rise buildings containing a mix of retail, office and service commercial uses. Fourth Street is designated as a major arterial, a transit

important street, and a part of the designated citywide pedestrian network north of Folsom Street in the City's Transportation Element. It is part of the County Congestion Management Program network and the federally designated Metropolitan Transportation System. North of Townsend Street, Fourth Street is a one-way southbound roadway providing four travel lanes plus parking on both sides. Two-way traffic is carried on Fourth Street between Townsend Street and Third Street although only MUNI buses are allowed northbound between King and Townsend Streets. MUNI buses providing service on the 15, 30, 45, and 42 lines use Fourth Street. Fourth Street provides access to and from the west on I-80 via an on-ramp at Harrison/Fourth Streets and an off-ramp at Bryant/Fourth Streets. Fourth Street provides access to the Caltrain terminal at Townsend/Fourth Streets.

Fifth Street

Fifth Street extends from Berry Street to King Street and from Townsend Street to Market Street. Near the Project Area, Fifth Street serves primarily low-rise buildings containing a mix of retail and service commercial uses. The portion north of Brannan Street is designated as a major arterial in the Transportation Element. The portion north of Townsend Street is designated as a citywide bike route in the Transportation Element. The portion north of Brannan Street is part of the County Congestion Management Program network and the federally-designated Metropolitan Transportation System. Fifth Street is a two-way roadway providing four travel lanes plus parking on both sides. Fifth Street provides access to and from I-80/Bay Bridge via an on-ramp at Bryant/Fifth Streets and an off-ramp at Harrison/Fifth Streets. Fifth Street provides access to the Powell Street BART station at Market Street. In the Mission Bay Project Area, Fifth Street provides access to I-280 at King Street, opened in late November 1997.

Seventh Street

Seventh Street defines the western border of the Mission Bay Project Area. It is a major arterial from Bryant Street to Market Street, and is classified as a secondary arterial throughout the majority of the Project Area, from Bryant Street to 16th Street. It is a four-lane two-way street, and is part of the Citywide Bicycle Route from 17th Street to 23rd Street. It is part of the Congestion Management Program network north of Mission Bay, from Market Street to Bryant Street, and is part of the Metropolitan Transportation System from Market Street to 16th Street.

Terry A. François Boulevard

Terry A. François Boulevard is located in Mission Bay South and extends in the north-south direction along San Francisco Bay between China Basin Channel and Illinois Street. It currently serves as the

eastern boundary of the project site south of Mission Rock Street. It is a wide, two-lane street with diagonal parking on both sides in the southern portion, and has parallel parking on both sides in the northern section. There are no sidewalks on either side of the street; there is a pedestrian path on the west side of Agua Vista Park adjacent to the street. Terry A. François Boulevard is designated as a component of the Citywide Pedestrian Network in the *San Francisco General Plan* Transportation Element.

Proposed Streets in Project Area

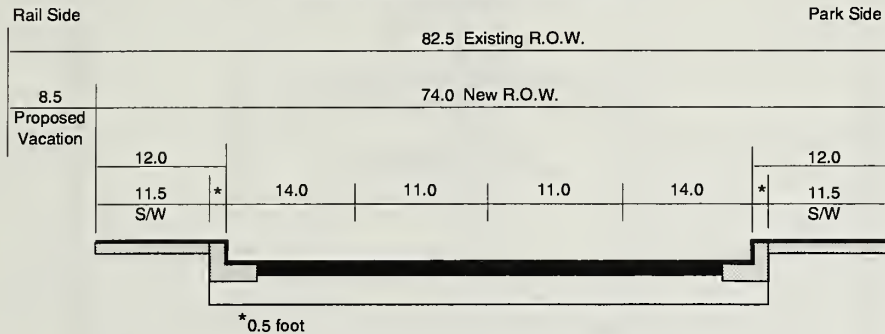
The following provides a description of changes to the proposed roadway system planned for the Mission Bay Project Area. It is based on the Infrastructure Plan being prepared by Catellus Development Corporation (Catellus) and the San Francisco Redevelopment Agency, which is currently in a draft form. The changes described below are assumed to be part of the project and are included in the transportation impacts analyses for this SEIR. Typical cross-sections for the streets described are shown in Figures D.1, D.2, D.3, D.4, D.5, D.6, and D.7. The Project Infrastructure Plan includes a new system of local neighborhood and collector streets, new major streets, plus major improvement to existing streets. The traffic impact analysis in this SEIR assumes implementation of all changes described below.

Mission Bay North

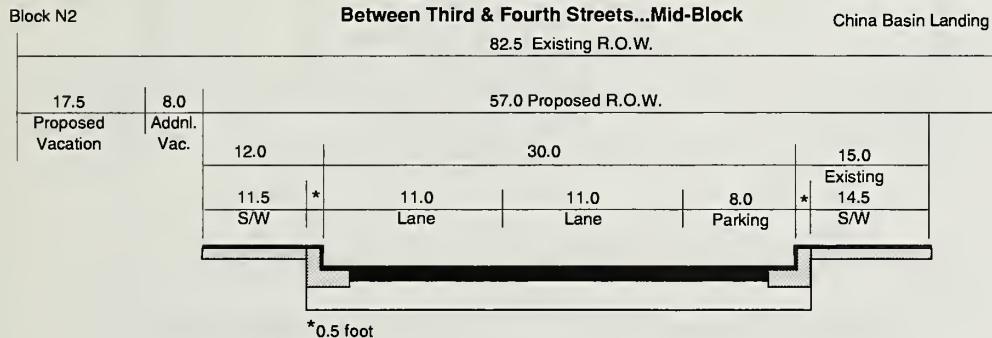
Berry Street

Berry Street would be developed as a linkage between Seventh Street and King Street. It will also connect with the planned westbound King Street frontage road to be built by the City on the north side of the I-280 on/off-ramp structures. The existing inactive at-grade crossing of the Caltrain tracks would be re-opened and improved by repaving the existing road, providing automatic gates and flashing light signals, and installing rubberized surfaces across the tracks. Between Seventh Street and the King Street frontage road, Berry Street would have two travel lanes in each direction with no parking. During the off-peak commute periods, Berry Street between the frontage road and Fifth Street would be configured as a two-lane street (one lane each way) with parking on the south side. During the morning and evening peak commute periods, parking would be prohibited to accommodate an additional eastbound lane. The project proposes to close Berry Street between Fifth and Fourth Streets to public vehicular use, but would maintain emergency vehicle, pedestrian, and bicycle access. Between Fourth and Third Streets, Berry Street would accommodate one travel lane in each direction, with parallel parking on the south side. At the intersections of Berry Street with Fourth and Third Streets, the right-of-way would be widened by approximately 10 feet to provide an additional

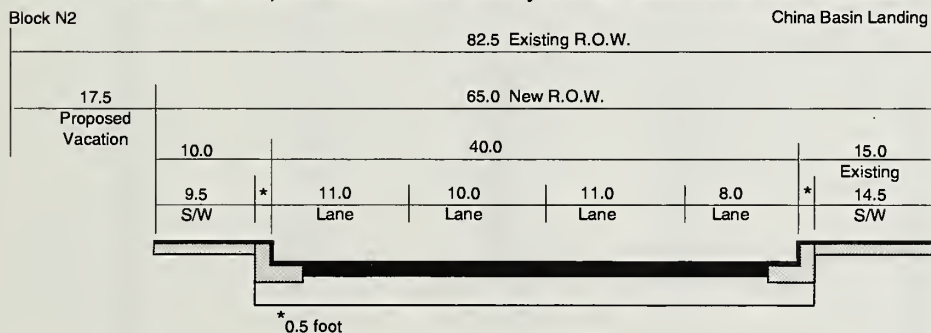
PROPOSED BERRY STREET
Between Sixth Street & Seventh Street



PROPOSED BERRY STREET
Between Third & Fourth Streets...Mid-Block



PROPOSED BERRY STREET
Additional Lane, from Fourth to 150' easterly of Fourth Similar Section at Third Street

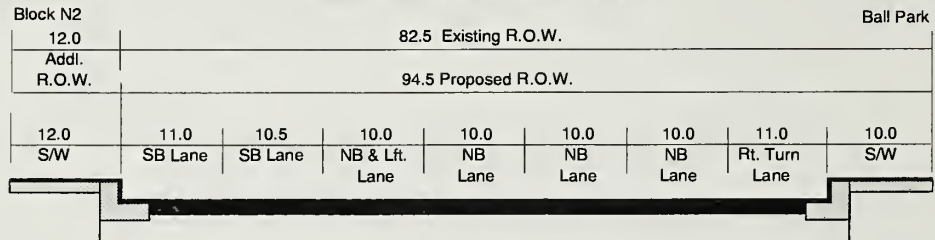


Not to Scale

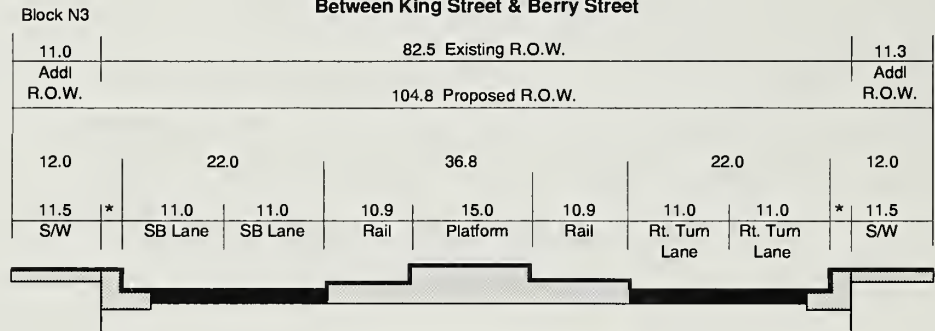
Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

PROPOSED THIRD STREET
Between King Street & Berry Street



PROPOSED FOURTH STREET
Between King Street & Berry Street



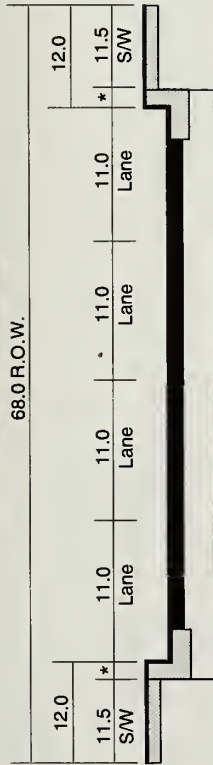
* 0.5 foot

Not to Scale

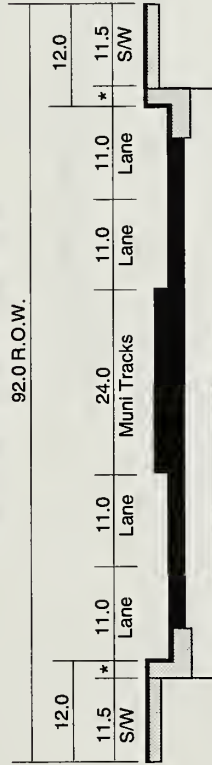
Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

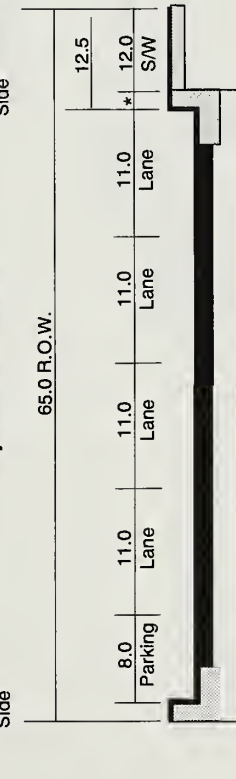
PROPOSED OWENS STREET South of Roundabout



PROPOSED OWENS STREET New Fourth Street to Third Street



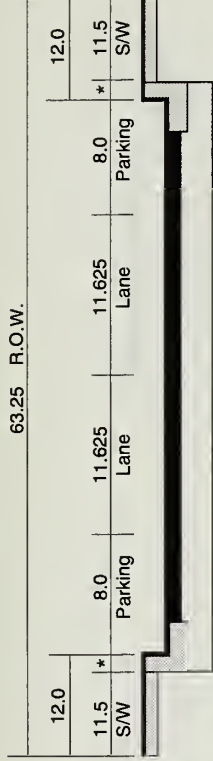
PROPOSED OWENS STREET Adjacent to Channel



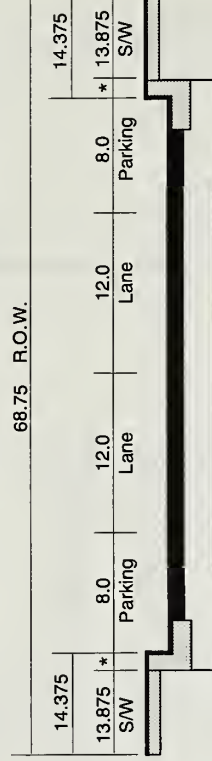
Not to Scale

Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

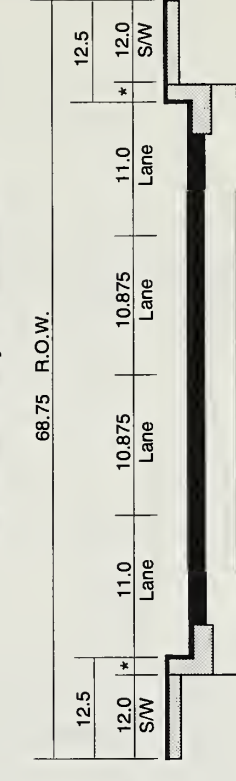
PROPOSED EAST-WEST RESIDENTIAL STREETS



PROPOSED NORTH-SOUTH RESIDENTIAL STREETS



PROPOSED SOUTH STREET Third Street to Terry A. Francois Blvd.

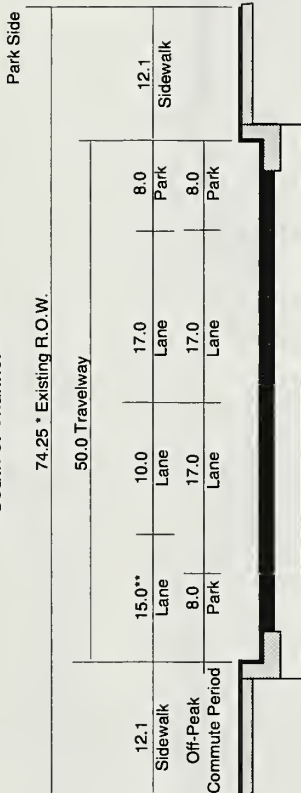


MISSION BAY SUBSEQUENT EIR

FIGURE D.3 MISSION BAY SOUTH: OWENS STREET, EAST-WEST RESIDENTIAL STREETS, NORTH-SOUTH RESIDENTIAL STREETS AND SOUTH STREET CROSS SECTIONS

SOURCE: KCA Engineers

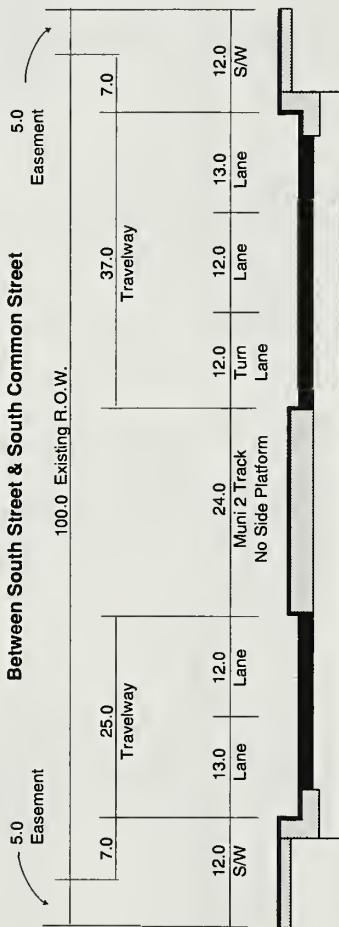
PROPOSED FOURTH STREET South of Channel



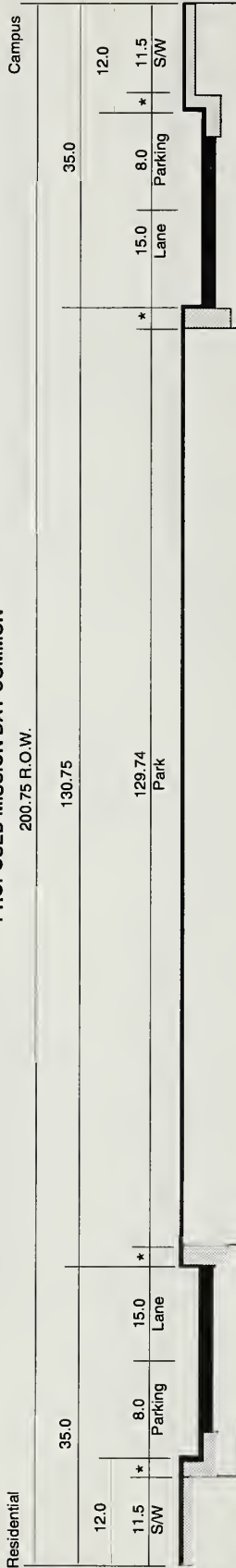
* Provide widened R.O.W. at selected locations for left turns.

** Accommodates bicycles

PROPOSED THIRD STREET Between South Street & South Common Street



PROPOSED MISSION BAY COMMON



* 0.5 foot

Not to Scale

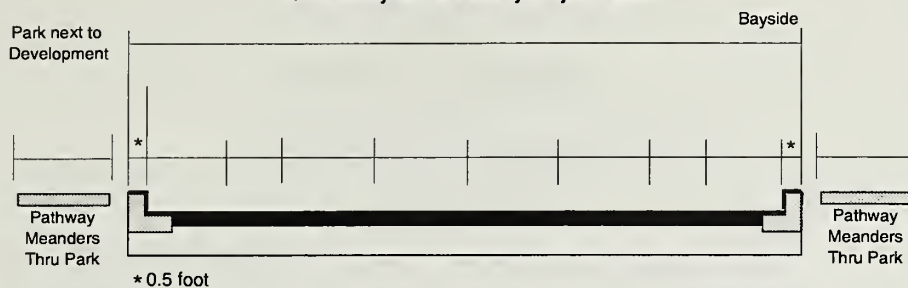
Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. SW= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

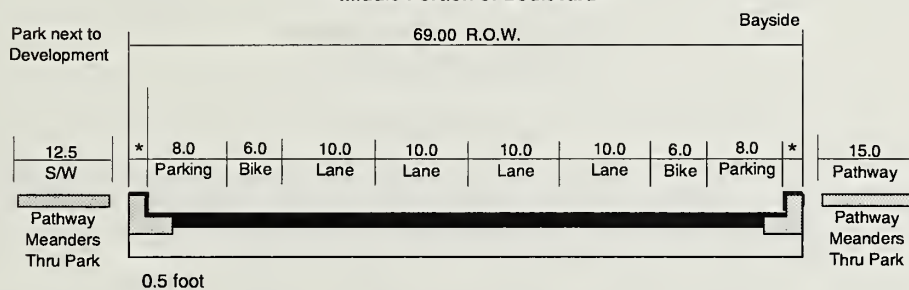
MISSION BAY SUBSEQUENT EIR

FIGURE D.4 MISSION BAY SOUTH: THIRD STREET, FOURTH STREET, AND MISSION BAY COMMON CROSS SECTIONS

**TERRY A. FRANCOIS BLVD.
At Northerly and Southerly Project Limits**



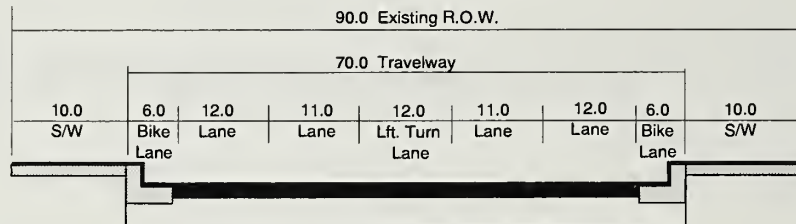
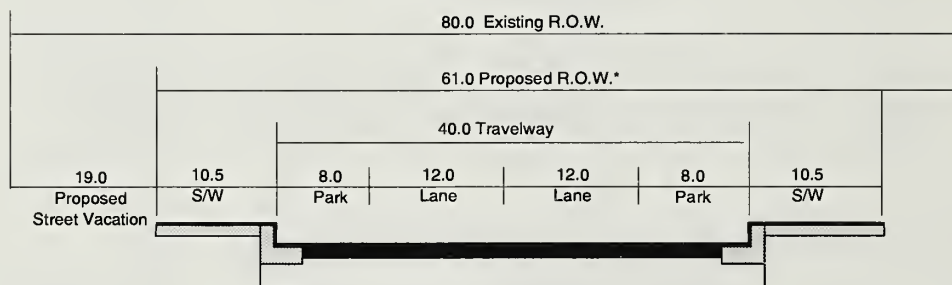
**TERRY A. FRANCOIS BLVD.
Middle Portion of Boulevard**



Not to Scale

Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

PROPOSED 16TH STREET**PROPOSED ILLINOIS STREET**
16th Street to Mariposa Street

* Provide widened R.O.W. at selected locations for left turns.

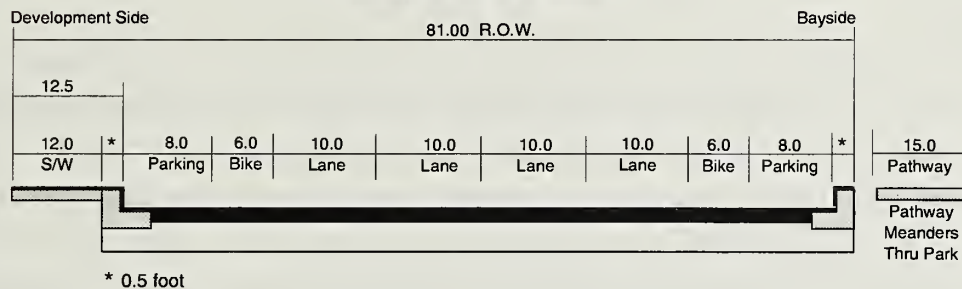
Not to Scale

Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

MISSION BAY SUBSEQUENT EIR
FIGURE D.6 MISSION BAY SOUTH: ILLINOIS STREET
AND 16TH STREET CROSS SECTIONS

TERRY A. FRANCOIS BLVD. VARIANT **Middle Portion of Boulevard**



Not to Scale

Note: Precise traffic and bicycle lane widths are subject to change as detailed project planning progresses. Dimensions are in feet unless otherwise noted. S/W= Street Width, R.O.W. = Right of Way

SOURCE: KCA Engineers

outbound lane. The section of Berry Street between Third and Second Streets was closed to vehicular and pedestrian traffic in November 1997 for construction of the San Francisco Giants Ballpark and will be eliminated as part of that project.

King Street

A new exclusive left-turn only lane would be provided on King Street, in the westbound direction, to facilitate southbound movements onto Fifth Street for improved access to proposed residential development. The left-turn lane would be constructed within the existing King Street right-of-way, by narrowing approximately 250 feet of the existing landscaped median located on the north side of King Street, to the east of Fifth Street. In addition, the I-280 off-ramp touch-down at King Street would be restriped to increase the number of eastbound lanes from the existing two to three. The additional eastbound through lane would be located on the north side of the off-ramp, within the existing right-of-way and without requiring modification of the ramp structure. The existing landscaped median, located on the south side of King Street across from the off-ramp, would be narrowed for approximately 300 feet. No modifications to the existing MMX light rail right-of-way would be required for either the new exclusive westbound left-turn lane or the additional eastbound through lane.

The existing street right-of-way on the south side of King Street, between Fifth and Fourth Streets, would be widened up to about 11 feet to provide an additional eastbound right-turn-only lane from King to Fourth Streets. On-street parking on the south side of King Street between Fifth and Fourth Streets would be prohibited.

Third Street

Third Street, between Berry and King Streets, would be widened as part of the Mission Bay project in order to accommodate an additional northbound lane. The existing right-of-way would be widened by approximately 12 feet, on the west side of the street. There would be no on-street parking on Third Street between the Channel and King Street.

Fourth Street

Fourth Street, between Berry and King Streets, would be widened as part of the Mission Bay project in order to accommodate the proposed Third Street light rail trackage and a station platform, requiring approximately 36 feet of the roadway. The existing right-of-way would be widened by approximately 22 feet evenly split between both sides (approximately 11 feet on each side). Fourth

Street between Berry and King Streets would accommodate two travel lanes in each direction in addition to the proposed light rail tracks and station platform. On-street parking would be prohibited.

Fifth Street

Fifth Street between King and Berry Streets would accommodate two travel lanes in each direction and an 8-foot-wide landscaped median. On-street parking would be prohibited.

Traffic Signalization

The existing traffic signal at the intersection of King Street with Third and Fourth Streets would be reconstructed to accommodate an additional northbound and eastbound lane, respectively. Additionally, the existing traffic signals on Berry Street at Third and Fourth Streets would be rehabilitated (traffic signal heads would be relocated and/or replaced) to accommodate widening of the streets. The Infrastructure Plan also proposes that the existing traffic signal at the intersection of King Street and Fifth Street be modified to incorporate a protected westbound left-turn phase. Finally, a new traffic signal would be installed at the intersection of Berry Street and Seventh Street.

Mission Bay South

Owens Street

Owens Street would be improved and extended to provide a primary north-south connection between Mariposa Street and Third Street. The existing Owens Street between 16th Street and the new roundabout intersection at the north-west corner of the UCSF site would be reconstructed and widened to two lanes each way. Some additional widening would occur at major intersections such as 16th and Mariposa Streets to provide exclusive left-turn lanes. Owens Street would also be extended east, to connect the roundabout with Third Street, replacing the existing access easement running along the south side of the China Basin Channel (Channel Street). The right-of-way section of Owens Street between Fourth and Third Streets would be about 24 feet wider than the rest of the street, in order to accommodate a semi-exclusive double track for the MUNI Metro Third Street light rail extension. The plan proposes that northbound Owens Street be located so that direct access from the northbound I-280 off-ramp at Mariposa Street is provided. Southbound Owens Street, on the other hand, would connect with Mariposa Street, but would not be straight aligned with the southbound I-280 on-ramp. On-street parking would be prohibited except on the north side of the street between Fourth Street and the roundabout intersection, adjacent to the park along the south edge of the Channel.

Fourth Street

South of the China Basin Channel, Fourth Street would be realigned and extended as a new street parallel to Third Street between the new Owens Street and Mariposa Street. During the off-peak commute periods, Fourth Street would be configured as a two-lane street (one 17-foot-wide lane each way to accommodate automobiles and bicycles), with parking on both sides. In addition, exclusive northbound and southbound left-turn lanes would be provided at the intersection with 16th Street. During the morning and evening peak commute periods, parking on Fourth Street would be prohibited on one side of the street to accommodate an additional wide curb lane (15 feet) to be shared by automobile and bicycle traffic.

Third Street

The existing lane configuration on Third Street through Mission Bay South would be modified as part of MUNI's Third Street light rail extension, a separate project. MUNI's extension project calls for the elimination of parallel parking on both sides of the street in order to accommodate a double track for light rail in a semi-exclusive alignment and station platforms in the median.

As part of the project, the existing Third Street right-of-way would be widened between the extended Owens Street and Mariposa Street by a 5-foot easement on both sides of the street. The new 110-foot cross-section would accommodate wider sidewalks, two traffic lanes each way, and exclusive left-turn lanes at major intersections. The roadway would be repaved and restriped, and the sidewalks would be reconstructed. At the intersection of Third and 16th Streets, the right-of-way on the east side of the street south of 16th Street would be widened by approximately 10 feet for about 150 feet to accommodate a second exclusive northbound left-turn lane.

Terry A. François Boulevard

This existing street would be improved as a north-south street serving the easternmost portion of the Mission Bay Project Area south of China Basin Channel, as well as Port of San Francisco properties. The project calls for Terry A. François Boulevard to be restriped to accommodate two traffic lanes and one bicycle lane each way, with parallel parking on both sides.

North Common and South Common Streets

North Common and South Common Streets would consist of two parallel east-west one-way roadways separated by an approximately 130-foot-wide grassy area, on the north side of the UCSF site, running

from Terry A. François Boulevard to the roundabout intersection and the Seventh Street connector. Between Terry François Boulevard and Mission Bay Street, each roadway would have one 15-foot-wide lane to be shared by automobile and bicycle traffic, and parking on the curb side. Parking would be eliminated on the approaches to Fourth Street, Third Street, and Terry A. François Boulevard for approximately 150 feet to accommodate an exclusive right-turn lane. Between Mission Bay Street and the Owens Street roundabout, each roadway would have two traffic lanes with no parking. North Common and South Common Streets would serve as the project's primary east-west access route.

Seventh Street Connection

A new street extending west from the planned intersection of Owens Street and North Common and South Common Streets to Seventh Street is proposed as part of the project. This connection would provide Mission Bay South with a primary access to the city neighborhoods west of Seventh Street, including the UCSF Parnassus Heights site. The connection would consist of two one-way, two-lane roadways with an at-grade, automatic gated crossing of the Caltrain tracks; parking would be prohibited on these roadways. This proposed at-grade crossing of the Caltrain tracks would replace an existing railroad crossing at King Street which is to be abandoned. The implementation of this new crossing would require approvals from the Peninsula Joint Powers Board (for Caltrain) and the State of California Public Utilities Commission (CPUC). Rubberized surfaces would be installed across the tracks at the crossing for bicycle safety.

16th Street

Sixteenth Street, between Third and Seventh Streets, would be repaved and restriped, maintaining the existing cross-section. That is two lanes each way, with striped bicycle lanes on both sides. Exclusive left-turn lanes would be provided at major intersections, such as Owens, Fourth, and Third Streets. The existing sidewalks would also be reconstructed. The section of 16th Street between Third Street and Terry A. François Boulevard would have a similar configuration. Parking on 16th Street would be prohibited. Rubberized surfaces would be installed across the tracks at the existing Caltrain railroad crossing near Seventh Street.

Mariposa Street

The Mission Bay plan calls for Mariposa Street to be widened on the north side, between Terry A. François Boulevard and Pennsylvania Street, from the existing configuration to two lanes each way,

with exclusive left turn lanes at major intersections, such as Third, Fourth, and Owens Streets, as well as the I-280 on-ramp. The existing on-street parking on Mariposa Street would be eliminated.

Illinois Street

Illinois Street, between 16th and Mariposa Streets, would be repaved and restriped, decreasing the cross-section right-of-way from the existing 80 feet to 61 feet. Illinois Street would accommodate one lane each way, with parallel parking on both sides. The existing, short, dead-end roadway section north of 16th Street would be eliminated.

Residential Streets

A series of new residential streets would be created or extended into Mission Bay South. These would include the streets designated Mission Bay, Rincon, and Mission Rock Streets on the various figures in this SEIR (see, e.g., Figure V.E.8 or Figure III.B.3). (Street names are included for ease of reference here; they do not establish final names of new streets in the Project Area.) These residential streets would serve the northern portion of Mission Bay South and would consist of one traffic lane each way, with parallel parking on both sides.

Traffic Signalization

New traffic signals would be installed at the intersections of Owens Street with Third and Fourth Streets. Additionally, new traffic signals are proposed along 16th Street at Seventh, Owens and Fourth Streets. The existing traffic signal at the intersection of 16th Street with Third Street would be reconstructed (traffic signal heads and poles would be relocated and/or replaced) to accommodate a second exclusive northbound left-turn lane. The existing traffic signals along Mariposa Street, at Third Street and at the I-280 off-ramp/Owens Street would also be rehabilitated (existing traffic signal heads and poles would be relocated and some new ones would be added) to accommodate the widening of Mariposa Street. Two new traffic signals would be installed at the intersections of Mariposa Street with the I-280 on-ramp and with Fourth Street. Two new traffic signals are proposed on Third Street at South Street and Third Street at North Common and South Common Streets. A new traffic signal may be provided to serve the UCSF site at a future intersection of a private UCSF street with Owens Street, or with another Project Area street adjacent to the UCSF site. Finally, a new traffic signal would be installed at the intersection of Seventh Street with the Common Streets (Seventh Street connection).

Fourth Street Intersection with Mariposa Street

As noted above under “Fourth Street,” Fourth Street in Mission Bay South is proposed to be extended south to Mariposa Street, parallel to Third Street from China Basin Channel. Fourth Street is proposed to shift to the west between 16th Street and Mariposa Street to meet Minnesota Street where it now intersects Mariposa Street from the south. The configuration was proposed by Catellus after consideration of other geometric alternatives for this portion of Fourth Street because the resultant minimization of the number of intersections (conflict points), and the relatively equal spacing of traffic signals (approximately every 450 feet) along Mariposa Street allows for even distribution of vehicular queues along the arterial and provides for effective traffic circulation.

The alternative configurations that were considered include extending Fourth Street southward from 16th Street in a straight alignment to intersect with Mariposa Street. The resulting configuration of two closely spaced “T” intersections (i.e., Mariposa Street and Fourth Street, Mariposa Street and Minnesota Street) would produce unsafe conditions for traffic maneuvers (turning movements). The off-set, nonstandard geometric designs, which would align southbound vehicles on Fourth Street with northbound vehicles on Minnesota Street, would not be familiar to most drivers and, therefore, would be considered unsafe. Also, the short distance between the two intersections (approximately 80 feet) under this alternative would reduce the available storage space for queued vehicles on Mariposa Street, and would make the coordination of signal phases along Mariposa Street more difficult.

Another alternative would extend Fourth Street beyond 16th Street to connect with Owens Street somewhere north of Mariposa Street and south of 16th Street. This alignment would direct all southbound Fourth Street traffic onto Owens Street. The Owens Street southbound traffic, together with the redirected southbound Fourth Street traffic, would substantially increase traffic on Owens Street at its intersection with Mariposa Street and the I-280 northbound off-ramp. Under this scenario, it is projected that the Owens Street intersection with Mariposa Street would operate at LOS F. In addition, the congestion caused by combining Owens Street and Fourth Street southbound traffic flows would induce many drivers to seek other southward travel routes. These drivers would cause increased congestion at other locations, such as at the intersection of Third and Mariposa Streets.

A third alternative is the aligning of Fourth Street to intersect with Indiana Street rather than Minnesota Street. This alternative would route southbound Fourth Street traffic to an intersection that is immediately adjacent (less than 80 feet) to the intersection of Owens Street, Mariposa Street and the I-280 southbound off-ramp, and would create close and unequal signal spacing on Mariposa Street

(Mariposa Street at Owens Street, Mariposa Street at Fourth Street and Indiana Street), and concentrated congestion at the intersections near the I-280 off-ramp.

SAN FRANCISCO GENERAL PLAN

The following Objectives and Policies in the *San Francisco General Plan* Transportation Element are potentially relevant to the proposed Mission Bay Project:

Objective 2: Use the transportation system as a means for guiding development and improving the environment.

Policy 2.5: Provide incentives for the use of transit, carpools, vanpools, walking and bicycling and reduce the need for new or expanded automobile and automobile parking facilities.

Objective 3: Maintain and enhance San Francisco's position as a regional destination without inducing a greater volume of through automobile traffic.

Policy 3.1: The existing vehicular capacity of the bridges, highways and freeways entering the city should not be increased and, for single-occupant vehicles, should be reduced where possible.

Objective 4: Maintain and enhance San Francisco's position as the hub of a regional, city-centered transit system.

Policy 4.5: Provide convenient transit service that connects the regional transit network to major employment centers outside the downtown area.

Objective 8: Maintain and enhance regional pedestrian and hiking access to the Coast, the Bay and Ridge trails.

Policy 8.1: Ensure that the Coast Trail, the Bay Trail and the Ridge Trail remain uninterrupted and unobstructed where they pass through San Francisco.

Policy 8.2: Clearly identify the Citywide Pedestrian Network where it intersects with the Coast, Bay and Ridge Trails.

Objective 11: Maintain public transit as the primary mode of transportation in San Francisco and as a means through which to guide future development and improve regional mobility and air quality.

Policy 11.1: Maintain and improve the Transit Preferential Streets program to make transit more attractive and viable as a primary means of travel.

Policy 11.2: Continue to favor investment in transit infrastructure and services over investment in highway development and other facilities that accommodate the automobile.

Policy 11.3: Encourage development that efficiently coordinates land use with transit service, requiring that developers address transit concerns as well as mitigate traffic problems.

Objective 12: Develop and implement programs in the public and private sectors, which will support congestion management and air quality objectives, maintain mobility and enhance business vitality at minimum cost.

Policy 12.2: Build on successful efforts implemented at numerous private sector worksites, such as the downtown Transportation Brokerage Program and voluntary programs, and adapt such programs for application in new areas as appropriate.

Policy 12.3: Implement private and public sector TDM programs, which support each other, and explore opportunities for private-public responsibility in program implementation.

Policy 12.8: Encourage the creation of Transportation Management Associations where specific needs are identified and coordination with other similar associations and agencies is pursued.

Objective 14: Develop and implement a plan for operational changes and land use policies that will maintain mobility and safety despite a rise in travel demand that could otherwise result in system capacity deficiencies.

Policy 14.6: Reduce peak period congestion through the promotion of flexible work schedules at worksites throughout the City.

Policy 14.7: Encourage the use of transit and other alternative modes of travel to the private automobile through the positioning of building entrances that prioritize access from these modes.

Objective 16: Develop and implement programs that will efficiently manage the supply of parking at employment centers throughout the City so as to discourage single-occupant ridership and encourage ridesharing, transit and other alternatives to the single-occupant automobile.

Policy 16.1: Reduce parking demand through the provision of comprehensive information that encourages the use of alternative modes of transportation.

Policy 16.3: Reduce parking demand through the provision of incentives for the use of carpools and vanpools at new and existing parking facilities throughout the City.

Policy 16.4: Manage parking demand through appropriate pricing policies including the use of premium rates near employment centers well-served by transit, walking and bicycling, and progressive rate structures to encourage turnover and the efficient use of parking.

Policy 16.5: Reduce parking demand through limiting the absolute amount of spaces and prioritizing the spaces for short-term and ride-share uses.

Objective 18: Establish a street hierarchy system in which the function and design of each street are consistent with the character and use of adjacent land.

Policy 18.1: Wherever feasible, divert through automobile and commercial traffic from residential neighborhoods onto major and secondary arterials, and limit major arterials to nonresidential streets wherever possible.

Policy 18.2: Design streets for a level of traffic that serves, but will not cause a detrimental impact on adjacent land uses.

Policy 18.3: The existing single-occupant vehicular capacity of the bridges, highways and freeways entering the city should not be increased and should be reduced if needed to increase the capacity for high-occupancy vehicles, transit and other alternative means of commuting, and for the safe and efficient movement of freight trucks.

Policy 18.4: Discourage high-speed through traffic on local streets in residential areas through traffic "calming" measures that are designed not to disrupt transit service or bicycle movement.

Policy 18.5: Mitigate and reduce the impacts of automobile traffic in and around parks and along shoreline recreation areas.

Objective 20: Give first priority to improving transit service throughout the City, providing a convenient and efficient system as a preferable alternative to automobile use.

Policy 20.2: Reduce, relocate or prohibit automobile facility features on transit preferential streets, such as driveways and loading docks, to avoid traffic conflicts and automobile congestion.

Policy 20.5: Place and maintain all sidewalk elements, including passenger shelters, benches, trees, newsracks, kiosks, toilets, and utilities at appropriate transit stops according to established guidelines.

Objective 21: Develop transit as the primary mode of travel to and from downtown and all major activity centers within the region.

Policy 21.1: Provide transit service from residential areas to major employment centers outside the downtown area.

Objective 22: Develop and improve demand-responsive transit systems as a supplement to regular transit services.

Policy 22.2: Consider possibilities for supplementary, privately operated transit services.

Objective 23: Improve the city's pedestrian circulation system to provide for efficient, pleasant, and safe movement.

Policy 23.2: Widen sidewalks where intensive commercial, recreational, or institutional activity is present and where residential densities are high.

Policy 23.5: Minimize obstruction to through pedestrian movement on sidewalks by maintaining an unobstructed width that allows for passage of people, strollers and wheelchairs.

Objective 24: Improve the ambience of the pedestrian environment.

Policy 24.2: Maintain and expand the planting of street trees.

Policy 24.3: Install pedestrian-serving street furniture where appropriate.

Policy 24.4: Preserve pedestrian-oriented building frontages.

Objective 27: Ensure that bicycles can be used safely and conveniently as a primary means of transportation, as well as for recreational purposes.

Policy 27.1: Expand and improve access for bicycles on city streets and develop a well-marked, comprehensive system of bike routes in San Francisco.

Policy 27.9: Identify and expand recreational bicycling opportunities.

Objective 28: Provide secure and convenient parking facilities for bicycles.

Policy 28.1: Provide secure bicycle parking in new governmental, commercial, and residential developments.

Objective 30: Ensure that the provision of new or enlarged parking facilities does not adversely affect the livability and desirability of the city and its various neighborhoods.

Policy 30.2: Discourage the proliferation of surface parking as an interim land use, particularly where sound residential, commercial or industrial buildings would be demolished pending other development.

Policy 30.5: In any large development, allocate a portion of the provided off-street parking spaces for compact automobiles, vanpools, bicycles and motorcycles commensurate with standard that are, at a minimum, representative of their proportion of the city's vehicle population.

Policy 30.6: Make existing and new accessory parking available to nearby residents and the general public for use as short-term or evening parking when not being utilized by the business of institution to which it is accessory.

Objective 31: Establish parking rates and off-street parking fare structures to reflect the full costs, monetary and environmental, of parking in the city.

Policy 31.1: Set rates to encourage short-term over long-term automobile parking.

Policy 31.2: Where off-street parking near institutions and in commercial areas outside downtown is in short supply, set parking rates to encourage higher turnover and more efficient use of the parking supply.

Objective 40: Enforce a parking and loading strategy for freight distribution to reduce congestion affecting other vehicular traffic and adverse impacts on pedestrian circulation.

Policy 40.1: Provide off-street facilities for freight loading and service vehicles on the site of new buildings sufficient to met the demands generated by the intended uses. Seek opportunities to create new off-street loading facilities for existing buildings.

Policy 40.2: Discourage access to off-street freight loading and service vehicle facilities from transit preferential streets, or pedestrian-oriented streets and alleys by providing alternative access routes to facilities.

Policy 40.4: Driveways and curb cuts should be designed to avoid maneuvering on sidewalks or in street traffic, but when crossing sidewalks they should be only as wide as necessary to accomplish this function.

Policy 40.5: Loading docks and freight elevators should be located conveniently and sized sufficiently to maximize the efficiency of loading and unloading activity.

Policy 40.8: Provide limited curbside loading spaces to meet the need for short-term courier deliveries/pickup.

Policy 40.9: Where possible, mitigate the undesirable effects of noise, vibration and emission by limiting late evening and early hour loading and unloading in retail, institutional, and industrial facilities abutting residential neighborhoods.

ANALYSIS APPROACH

This section describes the steps followed to develop future year (2015) background socioeconomic growth conditions for the Mission Bay project transportation analysis. This information on future conditions was used to update the regional travel demand model developed by the Metropolitan Transportation Commission (MTC) that analyzes the regional freeway and highway network in San Francisco and the rest of the region. The update was determined necessary to account for potential employment and population growth in San Francisco, primarily in various redevelopment survey areas, that was not included in the Association of Bay Area Governments' (ABAG) 1996 regional growth forecasts currently used in the MTC model.

The update of the MTC regional travel demand estimates was conducted in three steps: 1) developing updated San Francisco year 2015 land use/socioeconomic information for the proposed redevelopment

areas and the rest of San Francisco (see Table D.2 for a comparison of this 2015 information with forecasts for 2015 prepared by ABAG); 2) updating MTC's regional travel demand model to incorporate the revised population and employment growth forecasts, using an iterative technique^{2/} to obtain revised year 2015 travel demand estimates to and from San Francisco, reflecting the revised population and employment growth projections, in order to obtain revised year 2015 travel demand estimates to and from San Francisco; and 3) determining the numbers and travel paths of vehicles that would use the regional and local San Francisco street network during the p.m. peak hour. The year 2015 was chosen as the time frame for the future cumulative impact analyses based on the longest time frame provided in the ABAG *Projections '96* regional growth forecasts and the MTC regional model.

The San Francisco Redevelopment Agency and the Planning Department worked together with a consultant to prepare updated cumulative employment and population growth forecasts for San Francisco for 2015. A more detailed description of the steps taken to prepare the year 2015 cumulative growth forecasts update effort is presented in a series of technical memoranda prepared for the Redevelopment Agency and the Planning Department by economic and transportation planning consultants in April, May, and August 1997 and in March 1998.^{3/} Because the transportation analysis for this SEIR and for other EIRs in preparation on Redevelopment Agency proposals (such as EIRs for Bayview Hunters Point, Hunters Point Shipyard Reuse Plan, and the Treasure Island Naval Station Reuse Plan) required considerable amounts of time, work to revise the MTC regional transportation model to incorporate the new cumulative growth forecast information was carried out during summer, 1997, using preliminary forecast results from the April and May technical memoranda. The draft citywide 2015 cumulative growth scenario results, reported in an August 27, 1997 memorandum from Keyser Marston Associates to Stanley Muraoka of the Redevelopment Agency, are not substantially different from those used to revise the transportation model—about 100 more employees (less than 0.02%) and about 500 more residents (about 0.06%) were used in the revised transportation model than are shown in the August 27 memorandum. The March 1998 final memorandum added text explanation and did not substantially alter scenario results. It should be noted that no changes were made to the land use and socio-economic database in ABAG's *Projections '96* for the other eight counties included in the San Francisco Bay Area. Thus, the differences in population and employment shown in Table D.2 for San Francisco County (about 24,100 residents and 26,700 jobs, respectively) also represent the added growth for the entire nine-county San Francisco Bay Area. Based on the projected build-out horizon of the Mission Bay project, the new citywide growth forecast assumes about 70% of the total Research and Development/Office component of the Mission Bay South Redevelopment Plan would be built and occupied by 2015. However, in this SEIR, for conservative project-related analysis purposes, the full development of all of the Project Area was assumed and added to the MTC model, based on interim assumptions of full development provided by Hausrath Economics Group in July 1997.

TABLE D.2
ABAG VS. SAN FRANCISCO REVISED COMPARISON OF YEAR 2015
POPULATION AND EMPLOYMENT

	ABAG Projections '96		San Francisco Revised Projections		Difference	
	Population	Employment	Population	Employment	Population	Employment
Mission Bay Project	5,473	17,260	11,124	25,358	+5,671	+8,098
Rest of San Francisco	790,325	621,424	808,818	640,042	+18,493	+18,618
Total San Francisco	795,798	638,684	819,942	665,400	+24,144	+26,716

Source: ABAG Projections '96; and Keyser Marston Associates, Technical Memorandum: TAZ Projections for San Francisco, Cumulative Growth Analyses, to Stan Muraoka, SFRA, April 16, 1997.

The second step in preparing a cumulative transportation analysis was to update MTC's regional travel demand model to include the new San Francisco growth forecasts and full build-out in Mission Bay. Intensive computer requirements precluded rerunning the first three steps of the travel forecasting process to generate new trip tables./4/ Instead, MTC staff indicated that the current MTC trip tables (developed in 1996) for year 2015 could be adjusted using an iterative modeling technique to reflect the effects of the revised population and employment growth projections on the origin/destination trip tables./5/ The results from the updated MTC regional model, including full development in the Project Area, were reported for regional cumulative transportation effects at the regional traffic screenlines (the Golden Gate Bridge, the Bay Bridge, and U.S.101/I-280 at the San Francisco/San Mateo County line) and on the regional transit services. The Mission Bay component of the data used to update the MTC model was from an interim estimate of project population and employment growth, again due to timing of the MTC model update; therefore, the cumulative regional impacts reported in the SEIR are slightly overestimated (less than 0.1 %) compared to the results that would have been obtained had the employment and population totals discussed in "Project Area and Cumulative Citywide Growth" in Section V.C, Business Activity, Employment, Housing, and Population: Impacts, been available.

A future cumulative No Project scenario was created for the MTC model 2015 scenario by removing travel related to Mission Bay development but retaining all other added San Francisco growth.

The final step in the travel forecasting process was to conduct peak hour vehicular trip assignments using the updated year 2015 origin-destination trip tables as input to MTC's travel demand assignment model. The results of this process were year 2015 p.m. peak hour traffic estimates on the local street and regional highway networks in San Francisco and the rest of the Bay Area.^{6/} The results, which reflected the changes in population and employment described earlier, were then used to evaluate project impacts to local intersections within the study area. Project trip generation factors, described under "Methodology," below, and used to analyze project-specific impacts on local intersections, were based on land uses rather than on employment and population forecasts for the Project Area. By the time this step was carried out, final analyses were available for the project-specific land uses; therefore the numbers used for trip generation calculations for the project are the same as those used in the rest of the SEIR analyses.

The evaluation of project impacts on MUNI service has been conducted using a screenline analysis approach. MUNI screenlines are hypothetical lines representing aggregates of individual MUNI lines by corridor (as listed in Table V.E.3, with screenlines shown in Figure V.E.6), developed to measure conditions on combined MUNI transit lines from the greater downtown (including the Project Area) to other parts of San Francisco. This screenline analysis approach has been traditionally used for evaluation of projects in the greater downtown area and is based on the Downtown Plan and 1990 Mission Bay FEIR, which established the screenline definitions.

As a result of consultation with MUNI and Planning Department staff, the screenline locations and the transit routes included in each screenline have been modified for this Mission Bay project transit analysis, to better evaluate project impacts. The most important changes have been the elimination of "policy lines"^{7/} from the screenline analysis and further disaggregation of each screenline into subcategories or transit corridors. It should be noted that the points of measurement for the screenlines do not actually follow the alignments shown schematically in Figure V.E.6, but instead are measured at the actual maximum load point for each MUNI line crossing a screenline.

METHODOLOGY

This section describes in detail the analysis methodology used in quantifying the transportation effects of the Mission Bay project. It presents the specific trip generation rates for each land use type and their p.m. peak hour proportions. It also describes trip distribution characteristics, travel mode splits, and typical vehicle occupancy rates.

Trip Generation Assumptions

Trip generation involves the determination of person trips that would be generated by Mission Bay development. Each land use type has a corresponding rate that indicates the number of daily person trips generated by a unit area (usually, square feet or dwelling unit) of a particular type of development, including both trips into and away from each land use.^{/8/} Each type of space also has its own characteristic proportion of trips generated during the p.m. peak hour analysis time period. The time period chosen for analysis of predicted transportation needs was the peak hour of the 4:00 p.m. to 6:00 p.m. afternoon commute period. This time of day traditionally comprises a large portion of the total daily trips generated by any establishment, and consequently was chosen to reflect the worst case scenario within a typical weekday. The afternoon peak hour was chosen rather than the morning peak because the commute from greater downtown San Francisco to other parts of the City and to residential areas in the North Bay, East Bay, and South Bay is more concentrated during the afternoon peak. San Francisco workers largely contribute to the greater number of individuals traveling through San Francisco from jobs and other activities, such as shopping, to non-San Francisco destinations.

The daily trip rates and p.m. peak hour trip rates shown in Table D.3 are those for a typical weekday. The trip rates for the p.m. peak hour are given as percentages of the total weekday daily trips. As noted, the trip rates are based upon data gathered by the San Francisco Planning Department. Restaurant space generates substantially more person trips during the analysis period than retail establishments. The combination of the higher generation rate and the greater portion of the generated trips occurring during the p.m. peak hour yields many more trips than a comparable area of retail space. Some uses that could be established in the neighborhood-serving retail areas may have intermittent use, such as churches or small educational facilities (e.g., private sports schools or computer training facilities). In many cases the majority of travel to or from these uses occurs before or after the afternoon peak period and the p.m. peak hour trip rate would be relatively low; however, standard trip rates have been used for all but restaurant space in order to provide a most conservative (worst case) transportation impacts analysis.

The trip generation rate established for the proposed 25-screen movie theater was based upon attendance data gathered from the AMC Kabuki Theatres in San Francisco.^{/9/} Knowledge of the theaters' movie schedules and attendance for shows at various times of the day allows the determination of trip generation rates for the p.m. peak study period. A rate of 0.22 person trip per seat^{/10/} was chosen for individuals leaving the theaters during the p.m. peak, and a rate of 0.35 person trip per seat was selected for individuals arriving at the theaters during the same time.

**TABLE D.3
PERSON TRIP GENERATION RATES**

Land Use Type	Generation Rate Units (Person Trips Per)	Weekday Daily Trip Rate	Weekday PM Peak Hour Trips (% of Total Weekday Daily Trips)
Residential	Dwelling Unit	10	17.3%
Retail (neighborhood-serving)	1,000 square feet	150	4.0%
Restaurant	1,000 square feet	200	13.5%
Movie Theater	seat	1.83	15.6%
Hotel	Room	6.92	9.5%
School	Student	3	5.0%
Office	1,000 square feet	18	11.1%
Research and Development	1,000 square feet	7.8	16.0%
Large Retail	1,000 square feet	110	9.0%

Sources:

San Francisco Planning Department, *Guidelines for Environmental Review: Transportation Impacts*, Appendix 1, July 1991.

Movie Theater: AMC Kabuki 8 Theaters attendance data, January 1994.

Retail and Residential: San Francisco Planning Department, *Guidelines for Environmental Review: Transportation Impacts*, July 1991.

Hotel: San Francisco Planning Department, *Citywide Travel Behavior Survey, Visitor Travel Behavior*, August 1993.

Office: San Francisco Planning Department, *Citywide Travel Behavior Survey, Visitor Travel Behavior*, August 1993.

The generation rate for residential spaces is 1.73 afternoon peak-hour person trips per dwelling unit. The hotel rates indicate a person-trip generation of approximately 0.66 afternoon peak hour trip per room.

Trip generation rates for research and development space were not available from the City and County of San Francisco Planning Department. Therefore, several other sources of information were investigated, including methodologies from the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, Fifth Edition (January 1991), and from the *San Diego Traffic Generators Manual*

(May 1995). Data from the *UCSF Long Range Development Plan FEIR/11/* and the EIR completed for the Chiron Medical Life Sciences Center in Emeryville/12/ were also used for reference.

The trip generation rates established for the large, or “big box” retail stores were based upon information gathered by Wilbur Smith Associates in prior studies for similar projects. These projects include the Price/Costco warehouse in San Francisco, and the proposed Home Depot at Pier 80. In addition, the Institute of Transportation Engineers and the San Diego Association of Governments were used as sources of information.

Although the same unit area of a “big box” (large) retail establishment generates fewer daily trips than the neighborhood-serving retail space, the percentage of trips taking place during the p.m. peak hour is substantially higher. Thus, 1,000 gross square feet of large retail space generates nearly ten p.m. peak hour person trips, whereas the same area of neighborhood-serving retail space generates only six p.m. peak hour trips. A similar situation occurs when comparing trip generation rates for office uses with those for research and development space. While a given area of office space generates more daily person trips than the same area of research and development space, the trips are less concentrated during the p.m. peak hour. Thus, 1,000 gross square feet of office space generates approximately two p.m. peak hour person trips; the same amount of research and development space generates approximately 1.25 p.m. peak hour person trips.

Trip generation rate estimation for the UCSF Subarea considers the UCSF site, including the proposed city public school site. The trip generation rate for the University of California, San Francisco site is that described in the *UCSF Long Range Development Plan Final EIR./13/* The new UCSF site is estimated to generate 18,377 external person trips per average weekday. It is estimated to produce 1,620 vehicle trips per weekday p.m. peak hour, comprising approximately 15% of the total p.m. peak hour vehicle trips from Mission Bay South.

The trip generation information for the proposed approximately 500-student city school site was compiled from research done by Wilbur Smith Associates./14/ The ITE trip generation rates, Caltrans’ Trip Ends Generation Research Counts (December 1983), and the *San Diego Traffic Generators Manual* (May 1995) have provided some of the necessary information. A generation rate of three trips per student has been used.

Multi-Use Development Capture Rates

The trip generation rates presented in the previous sections are based on the trip-making characteristics of similar stand-alone existing uses. In order to estimate the number of trips generated

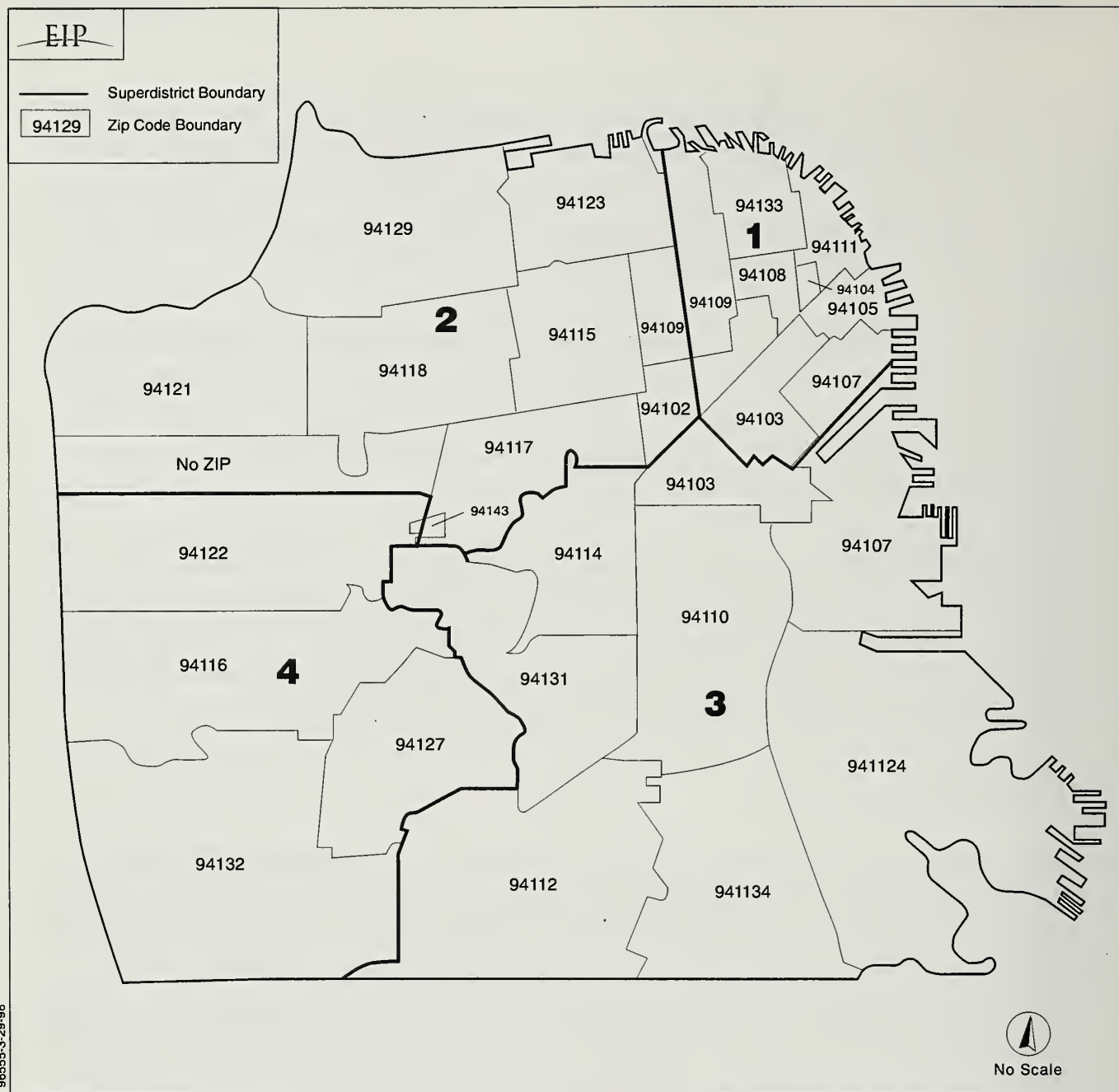
by the Mission Bay project, the trip generation rates presented earlier could be applied to each individual land use in the project, and then trip estimates from all land uses could be added together. However, this method does not take into consideration the fact that some of the trips being estimated would be made within the Project Area; that is, they would begin and end within the Mission Bay area/15/ and are, therefore, being “double counted.”

There is currently very little data available to quantify the number of trips that are internal to a multi-use development such as Mission Bay. Some information is available, however, from the Institute of Transportation Engineers/16/, which indicates that the average capture rate (the percentage of total project generated trips that begin and end within a multi-use development) during the p.m. peak period ranges from 15% to 45%, with an average rate of 29%.

After consultation with San Francisco Planning Department staff/17/, it was established that the stand-alone trip rate estimates for all travel modes, for those trips that begin or end in San Francisco’s northeast or southeast quadrants (where the proposed Mission Bay project would be located) would be reduced by 20%, to account for trips internal to the project. The net effect of this trip rate reduction was a 10% decrease in the total number of trips being generated by the project.

Trip Distribution Assumptions

The previously generated trips were distributed as originating from or being destined for the East Bay, South Bay, North Bay, outside the Bay Area, or to the four quadrants that divide the City and County of San Francisco. The four quadrants of the City are delineated to capture the different travel characteristics that are associated with the various street networks, transit opportunities, and geographical constraints of different areas of San Francisco. The northeast quadrant of San Francisco (Superdistrict 1), is bounded by Van Ness Avenue to the west, Townsend Street to the south, and the San Francisco Bay. The northwest quadrant of the City (Superdistrict 2), is bounded by Van Ness Avenue to the east, the southern boundary of Golden Gate Park to the south, and the Pacific Ocean. The southeast quadrant (Superdistrict 3) is bounded by the San Mateo County line to the south, and the San Francisco Bay to the east, and reaches westward to incorporate the Twin Peaks area. The southwest quadrant of the City (Superdistrict 4) is bounded to the south by the San Mateo County line, to the west by the Pacific Ocean, to the north by the southern boundary of Golden Gate Park, and extends eastward to the Twin Peaks area./18/ Figure D.8 shows the boundaries that define the Superdistricts. The East Bay includes Alameda, Contra Costa, Napa, and Solano Counties. The North Bay includes Marin and Sonoma Counties. The South Bay is defined by San Mateo and Santa Clara Counties. “Other” includes locations outside the Bay Area. Table D.4 shows the total trip distribution for the entire Mission Bay area./19/



SOURCE: EIP Associates

MISSION BAY SUBSEQUENT EIR

**FIGURE D.8 MAP OF SAN FRANCISCO SHOWING
SUPERDISTRICT BOUNDARIES**

TABLE D.4
PEAK HOUR PERSON TRIP DISTRIBUTION

	Mission Bay South				UCSF Subarea
	Mission Bay North	Central Subarea	East Subarea	West Subarea	
Superdistrict 1/a/	9.94%	6.11%	1.63%	1.53%	5.09%/b/
Superdistrict 2	2.77%	1.29%	2.43%	2.29%	
Superdistrict 3	4.31%	5.46%	6.74%	6.70%	
Superdistrict 4	1.04%	0.36%	1.57%	1.47%	
North Bay	1.58%	0.27%	1.10%	1.00%	
East Bay	3.72%	1.49%	2.59%	2.35%	0.93%
South Bay	3.10%	1.59%	4.54%	4.19%	2.44%
Other	6.54%	0.52%	0.68%	0.64%	0.00%
TOTAL	33.00%	17.09%	21.28%	20.17%	8.46%

Notes:

- See Figure D.8 for a map showing locations of Superdistricts.
- Trips generated by UCSF were distributed to three general Bay Area locations: the East Bay, the South Bay, and San Francisco/North Bay. This value represents the total distribution to all of San Francisco and the North Bay.

Sources:

Retail, Restaurant, and Hotel Visitors: *Citywide Travel Behavior Survey*, City and County of San Francisco Planning Department, August 1993.

Residential: Metropolitan Transportation Commission (MTC) Travel Demand Forecasting Model (Year 2015).

Movie Theater, Research and Development, Office, Hotel Workers: Supplemental Tables to the *Citywide Travel Behavior Survey*, City and County of San Francisco Planning Department, May 1993.

UCSF Site: University of California San Francisco, *UCSF Long Range Development Plan, Final Environmental Impact Report*, State Clearinghouse No. 95123032, January 1997, pp. 344-345.

The distribution values shown in Table D.4 represent the combination of the p.m. peak hour trips generated by each land use type in the entire Project Area. Tables D.5 through D.8 detail the trip distribution for each particular land use within each subarea. Table D.4 indicates the large number of trips that are made between Mission Bay North and other locations within the northeast quadrant.

The highest distribution of trips generated by the Central Subarea of Mission Bay South originates from or is destined for the northeast (Superdistrict 1) and southeast (Superdistrict 3) quadrants

TABLE D.5
MISSION BAY NORTH TRIP DISTRIBUTION - RESIDENTIAL, RESTAURANT, RETAIL

Geographic Region	Residential/a/	Restaurant		Retail/b/	
		Workers/b/	Visitors /c/	Workers	Visitors
San Francisco					
SuperDistrict 1	58.0%	12.8%	9.4%	12.8%	19.0%
SuperDistrict 2	5.0%	17.0%	7.8%	14.4%	8.0%
SuperDistrict 3	22.0%	13.6%	6.2%	17.0%	7.0%
SuperDistrict 4	1.0%	11.2%	1.9%	11.2%	4.0%
East Bay	7.0%	22.4%	14.3%	22.4%	10.0%
North Bay	1.0%	6.1%	7.2%	6.1%	7.0%
South Bay	6.0%	14.3%	12.3%	14.3%	10.0%
Outside the Region	0.0%	1.8%	41.8%	1.8%	35.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%

Note:

Trip generation between Superdistricts 1 and 3 has been reduced by 20% in order to account for internal trips (trips that begin and end within the Mission Bay area). Superdistricts are shown in Figure D.8.

Sources:

- Metropolitan Transportation Commission (MTC)/Association of Bay Area Governments (ABAG) Travel Demand Forecasting Model (Year 2015).
- Supplemental Tables (Superdistrict 1) to the *Citywide Travel Behavior Survey*, City and County of San Francisco, Planning Department, August 1993.
- Citywide Travel Behavior Survey, Visitor Travel Behavior*, City and County of San Francisco, Planning Department, August 1993 (Superdistrict 1).
- Metropolitan Transportation Commission (MTC)/Association of Bay Area Governments (ABAG) Travel Demand Forecasting Model (Year 2015).

locations. The East and West Subareas generate the largest proportion of trips to or from the southeast quadrant (Superdistrict 3). These values indicate the large portion of trips that begin and end within a particular geographic region, or Superdistrict, of the City.

Mode Split

“Mode split” is the designation of trips to the various means that people use to travel, such as automobile, transit, or walking, bicycling, taxi, or some other mode of transportation. The determination of the mode of transportation used in trips to and from Mission Bay depends on many

TABLE D.6
MISSION BAY NORTH TRIP DISTRIBUTION - MOVIE THEATER

Geographic Region	Distribution
San Francisco	58.0%
Superdistrict 1	23.0%
Superdistrict 2	16.0%
Superdistrict 3	13.0%
Superdistrict 4	6.0%
East Bay	11.0%
North Bay	6.0%
South Bay	7.0%
Outside the Region	18.0%
TOTAL	100.0%

Note:

Trip generation between to Superdistricts 1 and 3 has been reduced by 20% in order to account for internal trips (trips that begin and end within the Mission Bay area). Superdistricts are shown in Figure D.8.

Source: Supplemental Tables to the *Citywide Travel Behavior Survey*, City and County of San Francisco, Planning Department, August 1993.

characteristics of the trip, for example: the type of trip (work or leisure), the origin/destination of the trip to/from Mission Bay, and the specific area of interest within the Project Area.

Mission Bay North

The travel behavior of patrons differs from that of employees. Therefore, the percentages of restaurant and retail trips by auto, transit, and any other mode of transportation (e.g., walking, bicycling) were further divided into worker trips and visitor trips./20/ Although a greater number of persons use an automobile as a mode choice for all land types, restaurant trips have a substantially higher proportion of person trips using an automobile as the primary mode compared to other land use types. Auto person trips account for approximately 57.5% of the total person trips generated by Mission Bay North.

TABLE D.7
MISSION BAY SOUTH TRIP DISTRIBUTION - RESIDENTIAL, HOTEL, RETAIL, R&D/OFFICE

Geographic Region	Residential Distribution /a/	Hotel		Retail/b/		R & D /Office/d/	
		Workers/b/	Visitors/c/	Workers	Visitors	Workers	Visitors
San Francisco							
Superdistrict 1	46.0%	8.3%	4.6%	8.3%	7.0%	8.3%	17.0%
Superdistrict 2	6.0%	10.6%	2.0%	10.6%	9.0%	10.6%	14.0%
Superdistrict 3	31.0%	23.9%	4.5%	23.9%	61.0%	23.9%	14.0%
Superdistrict 4	1.0%	7.8%	0.9%	7.8%	5.0%	7.8%	7.0%
East Bay	8.0%	14.3%	5.8%	14.3%	3.0%	14.3%	22.0%
North Bay	1.0%	5.6%	3.0%	5.6%	2.0%	5.6%	9.0%
South Bay	7.0%	26.9%	2.1%	26.9%	10.0%	26.9%	13.0%
Outside the Region	0.0%	2.6%	77.1%	2.6%	3.0%	2.6%	4.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note:

Trip generation between Superdistricts 1 and 3 has been reduced by 20% in order to account for internal trips (trips that begin and end within the Mission Bay area). Superdistricts are shown in Figure D.8.

Sources:

- Metropolitan Transportation Commission (MTC)/Association of Bay Area Governments (ABAG) Travel Demand Forecasting Model (Year 2015).
- Supplemental Tables (SD3) to the *Citywide Travel Behavior Survey*, City and County of San Francisco Planning Department, August 1993.
- Citywide Travel Behavior Survey*, City and County of San Francisco Planning Department, August 1993 (Superdistrict 1).
- Supplemental Tables (Superdistrict 3, C-3) to the *Citywide Travel Behavior Survey*, Office Land Use City and County of San Francisco Planning Department, August 1993.

Mission Bay South

Because Mission Bay South is in the southeast quadrant (as opposed to Mission Bay North in the northeast quadrant) the mode split proportions are slightly different. However, the different types of land uses in Mission Bay North and Mission Bay South play a greater role in the mode split values than these locations in two different quadrants of the City. This can be seen by comparing the Central Subarea with the East and West Subareas in Mission Bay South (see Figure V.E.11 for a map showing subareas). The automobile is the favored mode choice in both areas, but the automobile is favored to a greater degree in the East and West subareas. This is largely attributable to the large, or "big box," retail establishments in those subareas. The automobile is chosen for approximately 86% of the person trips generated by these retail establishments.

TABLE D.8
UCSF SUBAREA TRIP DISTRIBUTION - UCSF SITE

Geographic Region	Distribution
San Francisco/North Bay	61 %
East Bay	10 %
South Bay	29 %
TOTAL	100 %

Source: University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, State Clearinghouse No. 95123032, January 1997.

Auto Occupancy

Automobile occupancy (the number of persons per vehicle) is also very sensitive to the trip purpose, and the origin/destination characteristics. Tables D.9 and D.10 detail the average auto occupancy rates of each land use type in Mission Bay North and South, respectively. The different geographic locations of the Mission Bay North and Mission Bay South areas yield different auto occupancy rates.

Tables D.11 through D.18 are referenced in Section V.E, Transportation, and they provide additional information on levels of service and other transportation details.

TABLE D.9
AVERAGE AUTO OCCUPANCY RATES - MISSION BAY NORTH

Geographic Region	Residential /a/	Restaurant		Retail/b/		Movie Theater/b/
		Workers /b/	Visitors /c/	Workers	Visitors	
San Francisco						
Superdistrict 1	1.20	1.28	2.62	1.28	1.64	1.64
Superdistrict 2	1.14	1.23	2.17	1.23	1.78	1.71
Superdistrict 3	1.14	1.29	3.09	1.29	1.86	1.86
Superdistrict 4	1.15	1.53	2.00	1.53	1.89	1.89
East Bay	1.17	3.33	2.61	3.33	2.26	2.26
North Bay	1.16	1.70	1.75	1.70	2.08	2.08
South Bay	1.15	1.23	2.56	1.23	2.55	2.55
Outside the Region	1.17	1.50	3.76	1.50	3.18	3.18

Note:

See Figure D.5 for a map showing superdistricts.

Sources:

- MTC Travel Demand Forecasting Model - Year 2015, Revised Land Use, Transportation Analysis Zone 658.
- Supplemental Tables (Superdistrict 1) to the *Citywide Travel Behavior Survey*, City and County of San Francisco, Planning Department.
- Citywide Travel Behavior Survey, Visitor Travel Behavior*, City and County of San Francisco, Planning Department (Superdistrict 1).

TABLE D.10
AVERAGE AUTO OCCUPANCY RATES - MISSION BAY SOUTH

Geographic Region	Residential /a/	Hotel		R&D/Office/d/		Retail/e/	
		Workers /b/	Visitors /c/	Workers	Visitors	Workers	Visitors
San Francisco							
Superdistrict 1	1.20	1.30	2.00	1.30	2.00	1.30	2.05
Superdistrict 2	1.14	1.26	3.00	1.26	1.07	1.26	1.78
Superdistrict 3	1.14	1.25	2.00	1.25	1.75	1.25	2.08
Superdistrict 4	1.15	1.48	2.80	1.48	1.22	1.48	2.19
East Bay	1.17	1.61	2.33	1.61	1.67	1.61	2.45
North Bay	1.16	1.44	2.00	1.44	1.63	1.44	1.78
South Bay	1.15	1.13	2.50	1.13	2.59	1.13	2.14
Outside the Region	1.17	1.56	2.88	1.56	1.93	1.56	1.91

Note: See Figure D.5 for a map showing Superdistricts.

Sources:

- a. MTC Travel Demand Forecasting Model - Year 2015, Revised Land Use, TAZ 657.
- b. Supplemental Tables (Superdistrict 3) to the *Citywide Travel Behavior Survey*, City and County of San Francisco, Planning Department.
- c. *Citywide Travel Behavior Survey, Visitor Travel Behavior*, City and County of San Francisco, Planning Department (Superdistrict 1).
- d. The Research and Development Office land use category in this table does not include the University of California San Francisco (UCSF) site. The UCSF site was analyzed as a separate use, using transportation information contained in the UCSF Long Range Development Plan FEIR. The average auto occupancy rate for the overall UCSF site is 1.16 persons per vehicle.
- e. Supplemental Tables (SD 3, C-3) to the *Citywide Travel Behavior Survey*, City and County of San Francisco, Planning Department (Superdistrict 1).

TABLE D.11
LEVEL OF SERVICE CRITERIA FOR A FREEWAY SECTION/a/

LOS	Maximum Density (pcpmpl)	Minimum Speed (miles per hour)	Max. Service Flow Rate (pcphpl)	Maximum Volume-to-Capacity Ratio
A	10.0	60	600	0.25
B	16.0	60	960	0.42
C	24.0	55	1,440	0.63
D	32.0	41	1,824	0.79
E	46.0	30	2,300	1.00
F	Varies	Varies	Varies	Varies

Notes:

LOS = Level of Service.

pcpmpl = Passenger cars per mile, per lane

pcphpl = Passenger cars per hour, per lane

a. Six to eight-lane freeways with a 60 mph free flow speed.

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report No. 209, Washington, D.C., 1994. Modified to fit criteria established in annual monitoring reports published by the San Francisco County Transportation Authority.

TABLE D.12
LEVEL OF SERVICE DEFINITIONS, SIGNALIZED INTERSECTIONS
BASED ON VEHICLE DELAY

Level of Service	Vehicle Delay (sec./veh.)	Typical Traffic Condition
A	≤ 5.0	Insignificant Delays: No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication.
B	5.1 - 15.0	Stable Operation/Minimal Delays: An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles.
C	15.1 - 25.0	Stable Operation/Acceptable Delays: Major approach phases are fully utilized. Most drivers feel somewhat restricted.
D	25.1 - 40.0	Approaching Unstable/Tolerable Delays: Drivers may have to wait through more than one red signal indication. Queues may develop but dissipate rapidly, without excessive delays.
E	40.1 - 60.0	Unstable Operations/Significant Delays: Volumes at or near capacity. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
F	≥ 60.0	Forced Flow/Excessive Delays: Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report No. 209, Third Edition, Washington, D.C., 1985 (updated 1994).

TABLE D.13
LEVEL OF SERVICE DEFINITIONS, UNSIGNALIZED INTERSECTIONS
BASED ON VEHICLE DELAY

Level of Service	Vehicle Delay (sec./veh.)	Typical Traffic Condition
A	≥ 5.0	Little or no delay
B	5.1 - 10.0	Short traffic delays
C	10.1 - 20.0	Average traffic delays
D	20.1 - 30.0	Long traffic delays
E	30.1 - 45.0	Very long traffic delays
F	≥ 45.0	/a/

Notes:

- a. Level of Service F exists when there are insufficient gaps of suitable size to allow a side street (minor street) demand to cross safely through a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches.

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report No. 209, Third Edition, Washington, D.C., 1985 (updated 1994).

TABLE D.14
RAILROAD CROSSING DATA
16TH STREET/SEVENTH STREET CROSSING

Time Gate Down	Time Gate Up	Total Time of Restricted Vehicular Flow (min.:sec)	Direction (SF/SJ)	Number of Vehicles Waiting	
				Eastbound	Westbound
Lights On	Lights Off				
3:53 p.m.	3:54 p.m.	01:25	SJ	8	14
4:28 p.m.	4:29 p.m.	01:18	SJ	6	11
4:33 p.m.	4:35 p.m.	01:17	SJ	5	8
4:37 p.m.	4:38 p.m.	01:17	SF	9	12
4:57 p.m.	4:58 p.m.	01:23	SJ	13	8
5:02 p.m.	5:03 p.m.	01:23	SJ	5	10
5:06 p.m.	5:07 p.m.	01:36	SF	9	14
5:28 p.m.	5:29 p.m.	01:19	SJ	9	10
5:33 p.m.	5:35 p.m.	01:24	SJ	10	12
5:37 p.m.	5:39 p.m.	01:45	SF	4	12
5:39 p.m.	5:40 p.m.	01:25	SJ	10	20
5:44 p.m.	5:45 p.m.	01:19	SJ	7	12
6:06 p.m.	6:07 p.m.	01:31	SF	4	13
6:08 p.m.	6:10 p.m.	02:08	SJ	7	18

Source: Wilbur Smith Associates. Data collected on Tuesday, July 1, 1997.

TABLE D.15
SAMTRANS SERVICE AND RIDERSHIP DESCRIPTION

Route	AM Peak Headway	Midday Headway	PM Peak Headway	Average Daily Ridership
1F	10 minutes	---	10 minutes	613
7F	30 minutes	30 minutes	25 minutes	3,102
16F	4 trips	---	4 trips	271
17F	3 trips	---	2 trips	183
18F	15 minutes	---	15 minutes	281
19F	20 minutes	---	20 minutes	306
41F	2 trips	---	3 trips	149
47F	3 trips	---	4 trips	240
48F	1 trip	---	2 trips	79
49F	1 trip	---	3 trips	168
5M	20 minutes	30 minutes	20 minutes	9,697
7B	20 minutes	30 minutes	25 minutes	5,633

Sources: San Mateo County Transit District, *SamTrans Short Range Transit Plan*, FY 1995/1996 to FY 2004/2005, September 1995; SamTrans Bus System Route Map, March 1996; Bay Area Transit Information Webpage: www.transitinfo.org.

TABLE D.16
SAN FRANCISCO MUNICIPAL RAILWAY SERVICE AND RIDERSHIP DESCRIPTION

Route	AM Peak Headway	Midday Headway	PM Peak Headway	Average Daily Ridership
15	10	10	6	26,342
22	4	6	4	21,153
30	6	9	8	25,261
32	15	15	12	1,088
42	10	12	10	16,090
45	6	8	7	15,057
48	12	20	12	7,721
80X	10	--	10	1,472
81X	10	--	10	1,084
82X	20	--	20	463

Sources: San Francisco Municipal Railway Short Range Transit Plan, July 1996 - June 2005, November 12, 1996; San Francisco Municipal Railway Street and Transit Map, 1996

TABLE D.17
LEVEL OF SERVICE CRITERIA FOR PEDESTRIANS

Quality of Flow	Conflicts	Square Feet per Person	Flow Rate/a/	Service Levels/b/
Open	None	Over 530	Under 0.5	A
Unimpeded	Minor	530 - 130	0.5 - 2	A
Impeded	Some	130 - 40	2 - 6	A
Constrained	50% Probability	40 - 24	6 - 10	B
Crowded	High Probability	24 - 16	10 - 14	C
Congested	Unavoidable	16 - 11	14 - 18	/c/
Jammed	Unavoidable	2 - 11	0 - 25	/c/

Notes:

- a. Flow Rate, persons per minute per foot of walkway width.
- b. Fruin, *Designing for Pedestrians*.
- c. Exceeds design capacity for pedestrian areas.

Source:

Pushkarev and Zupan, *Urban Space for Pedestrians*, Tables 3-6 & 3-7, MIT Press, 1975. Wilbur Smith Associates.

**TABLE D.18
GUIDELINES FOR BICYCLE PARKING FOR NEW CONSTRUCTION**

Land Use	Suggested Bicycle Parking Requirement/a/
Multi-Family Residential	
• General	1 Class I per unit, plus 1 Class II per 5 units
• Primarily for students and low-income families	1 Class I per unit, plus 1 Class II per 5 units
• Primarily for residents 62 or older	1 Class I per 10 units, plus 1 Class II per 10 units
Schools	
• Elementary, middle school, high school	1 Class I per 10 employees/b/, plus 1 spot per 4 students (50% Class I, 50% Class II)
Colleges	
• Student residences	1 Class I per 1.5 beds, plus 1 Class I per 10 employees/b/
• Academic buildings and other facilities	1 Class I per 10 employees/b/, plus 1 spot per 3 student seats (25% Class I, 75% Class II)
Parking Garages and Park-and-Ride Lots	20% of auto parking (75% Class I, 25% Class II)
Transit Centers	15% of daily boardings (75% Class I, 25% Class II)
Park-and-Ride Lots and Transit Centers	35% of required automobile spaces
Cultural and Recreational (includes libraries, theaters, museums, and religious institutions)	1 Class I per 10 employees/b/, plus 1 Class II per 500 s.f. or 20 seats (whichever is greater)
Park and Recreational Fields	1 Class I per 10 employees/b/, plus 1 Class II per 3 users during daylight times at peak season
Retail Sales, Shopping Centers, Financial Institutions, Supermarkets	1 Class I per 10 employees/b/, plus 1 Class II per 2,000 s.f.
Offices and Office Buildings	1 per 2,000 s.f. (75% Class I, 25 % Class II)
Hotels, Motels, and Bed and Breakfasts	1 Class I per 10 rooms, plus 1 Class I per 10 employees
Hospitals	1 Class I per 10 employees/b/, plus 1 Class II per 15 beds
Restaurants	1 Class I per 10 employees/b/, plus 1 Class II per 1,000 s.f.
Industrial	1 Class I per 10 employees/b/ or 5,000 s.f. (whichever is greater), plus 1 Class II per 5,000 s.f.
Day Care Facilities	1 Class I per 10 employees/b/, plus 1 Class II per 25 students
Auto-Oriented Services	1 Class I per 10 employees/b/
Other Uses	Same as most similar use listed.

Note:

- Class I bicycle parking spaces protect the entire bicycle and its components against theft, vandalism and weather. Class II bicycle parking spaces are racks that permit locking the bicycle frame and one wheel with a U-lock and support the bicycle without damage.
- Employees means the maximum number of employees on duty at any one time. When the suggestion is based on number of employees, the minimum number of spaces called for is 4, unless the above standards would call for 1 or fewer, in which case the minimum is 2.

Source: San Francisco Bicycle Plan, adopted March 4, 1997, Board of Supervisors Resolution No. 225-97.

NOTES: Appendix D, Transportation

1. The *Mid-Embarcadero Roadway Terminal Separator Structure Project Final EIS/EIR* (State Clearinghouse No. 92083065, case file 92.202E and 94.060E, certified September 1996) assumes Harrison Street to be one-way westbound between The Embarcadero and Third Street by the year 2015. However, at this time the Department of Parking and Traffic does not intend to implement the conversion of Harrison Street from two-way to one-way between The Embarcadero and Third Street.
2. The specific iterative technique used in the MTC origin/destination trip tables adjustment is known as a *Fratar* process. It adjusts the number of trips in each geographic area within the model individually by applying specified "production" or "origin" and "attraction" or "destination" growth factors to each trip table. Since the application of the origin factors affects the total number of trips destined to a geographic area and vice versa, the factoring process is repeated several times, in order to converge on a reasonable solution which, to the extent possible, preserves the already estimated totals for both origins and destinations for each geographic area.
3. Keyser Marston Associates, Inc., *TAZ Projections for San Francisco Cumulative Growth Analysis, Technical Memorandum*, April 16, 1997. Wilbur Smith Associates and Korve Engineering, *Year 2015 San Francisco Cumulative Growth Forecasts, Technical Memorandum*, May 22, 1997. Keyser Marston Associates, Inc., *San Francisco Cumulative Growth Scenario, Draft Technical Memorandum*, August 27, 1997; *Final Technical Memorandum*, March 30, 1998. A copy of these technical memoranda are available for public review in the project case file at the San Francisco Planning Department, 1660 Mission Street, San Francisco.
4. Initially, the intent was to incorporate the updated employment and housing growth projections into the MTC model, and have MTC staff run the first three steps of the travel demand forecasting process (trip generation, trip distribution and mode choice) to generate updated trip tables detailing the number of trips generated by Mission Bay, the origin/destination of these trips, and the percentage of these trips made by auto, transit or another mode. However, MTC staff indicated that due to time constraints, MTC would be unable to incorporate these revisions into their model.
5. Chuck Purvis, Senior Transportation Planner, Metropolitan Transportation Commission, telephone conversation with Wilbur Smith Associates, April 15, 1997.
6. The p.m. peak hour is chosen to reflect the most congested traffic conditions on the roadway network at any time during the period between 4 p.m. and 6 p.m. The observed hour of the highest level of congestion occurs at different times for different parts of the network, and varies from day to day as well. For instance, the hour of highest traffic congestion at one intersection may occur between 4:15 p.m. and 5:15 p.m., while another intersection or freeway ramp may experience the peak hour of congestion from 4:30 p.m. to 5:30 p.m. Determination of the p.m. peak hour of congestion for any particular intersection for any particular weekday is difficult, and analysis of network traffic conditions under such a detailed approach is less accurate. The typically chosen approach is more conservative in that the most congested hour of each part of the roadway network is selected, and compiled to form a common p.m. peak hour, within the 4 p.m. to 6 p.m. period. Although the p.m. peak hour of relative parts of the roadway network may not coincide, the assumption that each part's worst case scenario occurs simultaneously provides a more conservative approach that absorbs any traffic fluctuations.
7. Policy lines are generally defined as lines operating at greater than 10- to 12-minute headways during the peak periods. Their service is maintained independent of ridership and any capacity available on these lines cannot be redistributed to the rest of the transit system.

8. These trip generation rates are based either on local surveys such as the S.F. Planning Department's Citywide Travel Behavior Survey, August 1993, or surveys compiled by the Institute of Transportation Engineers and published in *Trip Generation*, Fifth Edition, 1991.
9. Wilbur Smith Associates, *Technical Methodology Memorandum*, June 4, 1997. A copy of this memorandum is on file for public review at the Office of Environmental Review, Planning Department, 1660 Mission Street, San Francisco.
10. One-way person trips per seat is reflective of the average attendance (in percent of total seats) for shows ending (outbound) and beginning (inbound) during or near the p.m. peak period.
11. University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, State Clearinghouse No. 95123032, certified January 1997.
12. City of Emeryville, *Chiron Development Plan Environmental Impact Report*, State Clearinghouse No. 9406300), certified June 1995.
13. University of California San Francisco, *UCSF Long Range Development Plan, Final Environmental Impact Report*, State Clearinghouse No. 95123032, certified January 1997.
14. Wilbur Smith Associates, technical memorandum to Bill Wycko, San Francisco Planning Department, July 25, 1997. A copy of this memorandum is on file for public review at the Office of Environmental Review, Planning Department, 1660 Mission Street, San Francisco.
15. The most common example would be a trip from home to work, for a person who lives and works in the Mission Bay Project Area. Another example would be trips made from the work place to shops, services, restaurants, or movie theaters.
16. Institute of Transportation Engineers, *Trip Generation*, Fifth Edition, January 1991, Chapter VIII, pp. I-14 to I-53.
17. Bill Wycko, Senior Planner, San Francisco Planning Department, memorandum summarizing several telephone conversations with Wilbur Smith Associates, July 28, 1997.
18. City and County of San Francisco, Planning Department, *Citywide Travel Behavior Survey, Visitor Travel Behavior*, August 1993.
19. The Citywide Travel Behavior Survey defines "other" as zip codes outside the Bay Area reaching from Washington and Oregon to Sacramento and south to Los Angeles and San Diego. Visitors arriving in San Francisco from the airport are considered to have traveled from the Peninsula.
20. Worker/Visitor split based upon the City and County of San Francisco Planning Department *Citywide Travel Behavior Survey, Visitor Travel Behavior*, August 1993 (Restaurant, Superdistrict 1), and Supplemental Tables to the City and County of San Francisco Planning Department *Citywide Travel Behavior Survey*, August 1993 (Restaurant and Retail, Superdistrict 1).

E. AIR QUALITY

This appendix includes additional details on the analysis methods for certain criteria air pollutants, namely, carbon monoxide and fine particulates as well as supporting data in Tables E.1-E.3.

Regarding toxic air contaminants, this appendix describes the fundamentals of risk assessment and how the expected types of toxic air contaminant emissions from the project were identified. Finally, this appendix presents tables containing information on ambient air pollutant concentrations and population projections.

CRITERIA AIR POLLUTANTS—ANALYSIS METHODS

Carbon Monoxide

Caltrans' CALINE4 program was used to model local carbon monoxide (CO) impacts. The CALINE4 model was implemented according to the guidelines contained in *Transportation Project-Level Carbon Monoxide Protocol ("CO Protocol")*.^{1/1} Emission factors were derived from the BAAQMD CEQA Guidelines.

Vehicular travel speeds on major arterials were obtained from the travel time analysis conducted by the project transportation consultant. For other surface streets in the general traffic study area, but not included in the arterial analysis, speeds were derived from relationships between traffic volume/lane/hour and travel speeds given in Tables B.13 and B.14 of the *CO Protocol*. For the Interstate 80 freeway mainline and ramps, travel speeds were derived from mainline and intersection levels of service, respectively, based upon the Highway Research Board's *Highway Capacity Manual*.

For existing and future cumulative traffic in the project site vicinity, the percentages of vehicles operating in hot stabilized or cold start modes were derived, based on times of day and roadway types, as recommended in Caltrans' Technical Advisory T950428.02.

Meteorological inputs to the CALINE4 model include wind speed, wind direction, wind variability, temperature, atmospheric stability, and vertical mixing height. Values for wind speeds and variability were assumed to change with the time of day based upon the relationship presented in Table B.11 of *CO Protocol*. CALINE4 automatically selected the "worst-case wind angle." Temperatures were taken from National Oceanic and Atmospheric Association monitoring data for San Francisco's Mission Dolores weather station. Atmospheric stability estimates were also obtained from the *CO Protocol's* Table B.11. A default mixing height of 1,000 meters (about 3,200 feet) was applied.

TABLE E.1
SUMMARY OF RECORDED AIR POLLUTANT LEVELS IN SAN FRANCISCO

Year	Ozone		Nitrogen Dioxide		Carbon Monoxide			PM ₁₀	
	1-hr High (ppm)	Number of Exceedances	1-hr High (ppm)	Number of Exceedances	1-hr High (ppm)	Number of Exceedances	8-hr High (ppm)	24-hr High (µg/m ³)	Number of Exceedances
1995	0.09	0	0.09	0	9.0	0	5.5	50	0
1994	0.06	0	0.09	0	7.5	0	5.3	n.a.	6
1993	0.08	0	0.08	0	10	0	6.9	69	5
1992	0.08	0	0.09	0	10	0	7.4	81	9
1991	0.05	0	0.10	0	14	0	8.4	109	15
1990	0.06	0	0.11	0	12	0	6.9	165	12

Notes:

The "high" is the highest concentration for the year. Exceedances for ozone, nitrogen dioxide, and carbon monoxide refer to federal and state standards, while those for PM₁₀ refer only to state standards. The ozone, nitrogen dioxide, and inhalable particulate data were collected at the 10 Arkansas Street station in San Francisco. The carbon monoxide data were collected at the 939 Ellis Street station in San Francisco.

ppm = parts per million
µg/m³ = micrograms per cubic meter
n.a. = not available

Source: California Air Resources Board, *California Air Quality Data Summaries 1995, 1993, 1992, 1991, 1990*; Bay Area Air Quality Management District, Air Currents, March 1996.

TABLE E.2
AMBIENT AIR TOXICS MONITORING DATA, 1996
10 Arkansas Street, San Francisco, California

Toxic Air Contaminant	Number of Observations	Maximum Concentration (ppb)	Minimum Concentration /a/ (ppb)	Mean Concentration (ppb)
methyl ethyl ketone	27	0.5	0.05	/b/
methylene chloride	31	1.8	0.5	0.66
styrene	31	0.2	0.05	0.06
chloroform	31	0.10	0.01	0.032
meta/para-xylene	31	2.7	0.3	0.67
1,3-butadiene	31	0.55	0.02	0.138
methyl chloroform	31	0.25	0.06	0.109
ortho-dichlorobenzene	31	0.3	0.05	0.08
para-dichlorobenzene	31	0.4	0.1	0.12
carbon tetrachloride	31	0.12	0.07	0.078
trichloroethylene	31	0.07	0.01	0.028
benzene	31	1.4	0.25	0.43
ethyl benzene	31	0.8	0.3	0.33
perchloroethylene	31	0.42	0.01	0.084
toluene	31	6.6	0.3	1.62

Notes:

ppb = parts per billion

- Observations that were less than the level of detection are displayed as one-half of the level of detection. Data for vinyl chloride, ethylene dibromide, and ethylene dichloride were all below the level of detection.
- Data for annual means were provided only for years with data in all 12 months.

Source: California Environmental Protection Agency, Air Resources Board, <http://arbis.arb.ca.gov/aqd/toxics.htm>.

A persistence factor (i.e., the ratio between local worst-case eight-hour and one-hour concentrations) of 0.8 has been applied to the modeled hourly CO concentrations to obtain eight-hour average estimates because this has been consistent with the *CO Protocol*'s recommendations for "urban sites with a recognized tendency for persistent stagnant meteorological conditions and/or persistent traffic congestion."

TABLE E.3
COMPARISON OF ASSOCIATION OF BAY AREA GOVERNMENTS PROJECTIONS '96
WITH SAN FRANCISCO CUMULATIVE
GROWTH SCENARIO

	San Francisco Cumulative Growth Scenario /a/,/b/		ABAG Projections '96 /c/	
	1995	2015	1995	2015
Employment	534,600	665,300	534,610	638,670
Households	311,430	343,622	311,430	338,390
Population	759,900	819,500	759,900	795,800
Employed Residents	376,800	428,030	376,800	415,400

Notes:

- a. San Francisco totals without adjustment for build-out of the Mission Bay Project Area. See Table V.C.8 and Table V.C.9 for the total San Francisco numbers analyzed in this SEIR (Project Area build-out plus "Rest of City" subtotals from the *SFRA San Francisco Cumulative Growth Scenario* prepared by Keyser Marston Associates.)
- b. Keyser Marston Associates, Inc., *San Francisco Cumulative Growth Scenario*, Final Technical Memorandum, prepared for the San Francisco Redevelopment Agency, March 30, 1998.
- c. Association of Bay Area Governments, *Projections '96*, December 1995.

Source: EIP Associates and Hausrath Economics Group.

Fine Particulates (PM₁₀)

U.S. Environmental Protection Agency (U.S. EPA) measurements of dust emissions during construction of a shopping center in Arizona indicate that about 1.2 tons of dust per month are emitted per acre of construction, about 64% of which is PM₁₀, a potential health threat to a sensitive population living near the construction activity. Thus uncontrolled construction-related PM₁₀ emissions could generate up to 51 pounds (lb) per acre per day, exceeding the BAAQMD's 80 lb/day significance threshold, when the area to be worked is greater than 1.5 acres.

TOXIC AIR CONTAMINANTS

This appendix provides additional background material to facilitate understanding of the toxic air contaminants discussion presented in Section V.F, Air Quality. The following topics are expanded

upon: fundamentals of risk assessment and methodology for identifying expected types of toxic air contaminant emissions from the proposed project.

Toxic Air Contaminants—Fundamentals of Risk Assessment

To provide a clear understanding of the potential impacts of toxic air contaminant emissions from the project on public health, it is necessary to discuss the elements of the risk assessment process and how risk is estimated. The following section describes this process.

Risk Assessment

A risk assessment is an estimate of both cancer and non-cancer health risks attributable to a particular emission source or a facility that emits toxic air contaminants from more than one source. Information regarding the toxic air contaminants emitted, their emission rates, their dispersion in the air, possible receptor locations, and chemical toxicity of toxic air contaminants is used to conduct a “screening-level” or a “formal” health risk assessment. A “screening-level” risk assessment uses worst-case assumptions and default values to roughly estimate the risks from toxic air contaminants, whereas a “formal” risk assessment uses more realistic assumptions and more complex, or sophisticated, computer modeling to more accurately quantify risk. A screening-level risk assessment is often used to determine whether a formal risk assessment is required.

Hazard Identification and Estimation of Emissions

The first step in the risk assessment process is to identify the compounds of concern, i.e., the compounds emitted that may be toxic. Next, the quantity of toxic air contaminant emissions must be estimated. Together, these steps may be referred to as an “emissions inventory.” Emissions are quantified using emission factors, expressed as grams per second or pounds per year. Emission factors are obtained from published sources or actual source tests (air monitoring data) of emissions from various types of devices and processes. Typically, these emission factors are conservative and tend to overestimate emissions.

Exposure Assessment

Using the emission factors and hours of operation, emissions can be quantified. Using emissions information and dispersion analysis, the concentrations of toxic air contaminants can be estimated at off-site locations. This process is called exposure assessment.

Dispersion is the dilution of an air pollutant as it moves away from its source. A dispersion analysis estimates the concentration of a toxic air contaminant at a point where a receptor could be exposed. To assess the potential for chronic health effects, these concentrations can be estimated for long-term exposures (30 years based on U.S. EPA Risk Assessment Guidelines for Superfund Sites or 70 years based on CAPCOA Air Toxics "Hot Spots" Risk Assessment Guidelines). To assess the potential for acute health effects, concentrations can be estimated for short-term (worst-case one-hour) exposures. These exposure scenarios tend to be conservative.

Toxic air contaminant concentrations typically drop off rapidly as distance increases from the source. Factors such as the types and rates of emissions; wind speed, direction, and temperature; and surface wind effects caused by buildings and terrain are incorporated into the dispersion analysis. Once these factors are accounted for in the dispersion analysis, the toxic air contaminant concentrations to which a receptor could be exposed can be estimated.

The type of emissions source greatly affects the dispersion of toxic air contaminants. Toxic air contaminants may be emitted from a point, volume, area, or fugitive source. A point source is typically a stack (or a point where toxic air contaminants are released). For these types of sources, the release parameters are especially important. The higher the stack, the greater the dispersion is, typically. Similarly, the higher the rate of release, the greater the dispersion. Stacks that have a high rate of release behave as though they have a higher stack height. This is known as "effective stack height." Higher temperatures in the exhaust stack can increase the effective stack height as well.

A volume source is usually a building or structure where toxic air contaminants are allowed to mix before being emitted. For that reason, the volume of the structure is used to calculate the emission of toxic air contaminants. An area source is defined by the surface area of the emission point. Typically, pools of liquid are treated as area sources. Fugitive emissions, or areas where it is difficult to estimate losses or emissions of toxic air contaminants from various devices or processes (e.g., valves and flanges), may also be modeled as area sources.

The direction of the wind and its speed, in particular, will contribute to plume formation during the dispersion of a toxic air contaminant. A plume is a concentration gradient extending vertically and laterally from the emission source. As a pollutant is dispersed, the concentration is diluted away from the source. High winds tend to cause an increase in dispersion and dilution of contaminants. Stable conditions, where wind speed is low and an inversion (thermal boundary layer preventing upward escape of pollutants) is present, tend to trap toxic air contaminants near their source. Wind direction may abruptly change during the course of a year, and even over a 24-hour period. Information regarding wind patterns is used to predict the dispersion of contaminants at downwind receptor locations.

The topography of a location usually influences the dispersion characteristics of toxic air contaminants. Tall buildings tend to decrease wind speed, which can decrease dispersion. In addition, buildings can cause an effect known as “downwash,” which can concentrate pollutants in turbulent eddies immediately downwind of the structures. This effect is most common when a taller structure is adjacent to a lower toxic air contaminant source.

“Receptor” is a term used to describe an individual who may be exposed to toxic air contaminants from an emissions source. A receptor can be real or hypothetical. Often, receptor locations where people actually live and work are included in a risk assessment. In addition, a risk assessment also considers a hypothetical individual who experiences a worst case exposure, or maximally exposed individual (MEI). The concept of the MEI is useful in estimating the point where toxic air contaminant emissions pose the greatest risk.

Whether or not the receptor is real or hypothetical, several assumptions are used to calculate exposure. These assumptions are conservative and designed to protect public health. Although these assumptions may appear to be unrealistic, they are designed to protect certain “sensitive” populations such as children, the sick, and the elderly. Typically, a risk assessment models two different types of receptor exposures. Concentrations are predicted for residential and off-site worker exposures using computer simulations.

Since most people spend a majority of their time at their place of residence, residential receptors are modeled for a full life-time exposure (30 years based on U.S. EPA Risk Assessment Guidelines for Superfund Sites or 70 years based on CAPCOA Air Toxics “Hot Spots” Risk Assessment Guidelines). A residential receptor is assumed to be exposed to toxic air contaminants at an estimated concentration for 24 hours a day, 365 days per year (30 years based on U.S. EPA Risk Assessment Guidelines for Superfund Sites or 70 years based on CAPCOA Air Toxics “Hot Spots” Risk Assessment Guidelines). The exposure scenario for off-site workers is usually 8 hours per day, 240 days per year, for 46 years./2/

In addition to the exposure duration for the different types of receptors, assumptions are made for the route of exposure to toxic air contaminants. Most toxic air contaminant exposures occur through the inhalation pathway, although some compounds are assimilated by the body through ingestion and dermal absorption as well. A risk assessment takes into account the average weight and amount of air breathed in per day by a “typical” individual, as well as ingestion rates and the amount of surface area of skin that can be subject to exposure. These exposure pathways can be used to predict the adverse health impacts of a particular toxic air contaminant.

Toxicological Assessment and Risk Characterization

Once the exposure concentration of a toxic air contaminant is estimated, actual risk is quantified using toxicity data. Some toxic air contaminants can be toxic in small quantities, while other toxic air contaminants are relatively harmless at higher exposure concentrations. In addition, health effects from short-term exposure to a particular toxic air contaminant may be inconsequential, but long-term exposure may be detrimental. Toxic properties of toxic air contaminants are usually expressed as a potency value. In comparing two compounds with equal exposure concentrations, the compound that exhibits greater toxic effects would be described as more potent than the other. For instance, chromium compounds are highly toxic in small quantities (a pound of chromium emitted annually may cause a significant health risk to nearby residents), but a similar quantity of isopropyl alcohol may not cause any measurable health risk.

As with the other steps in the risk assessment process, many assumptions are used in the toxicity analysis. Many toxicity data are derived from animal studies. Since it is difficult to know for certain if a specific animal model is appropriate for interpretation of health effects in humans, a sensitivity factor is often used to calculate the dose at which human exposure may cause adverse health effects. Dose is usually expressed in milligrams of a substance per kilogram of the receptor's body weight. The dose at which toxic effects are seen in rats is usually extrapolated to the human dose equivalent. To be on the safe side, this dose may be divided by a factor of ten to calculate the point at which humans may experience the same response, resulting in a more conservative estimate.

Several exposures of different types of toxic air contaminants may occur at each receptor location. To account for these types of multiple exposures, the toxic effects are simply added together. Possible synergistic effects or cancellation effects for combinations of toxic air contaminants are not considered. It is possible for two or more chemicals to combine and become more toxic than their individual additive effects or the combination of two or more toxic air contaminants may reduce their overall toxic effects. Since there are no data available on these types of effects for multiple toxic air contaminants exposure, risk assessments introduce another level of uncertainty by simply adding risks from each of the individual toxic air contaminants.

Assumptions regarding quantity and type of emissions, dispersion of pollutants, duration of exposure, receptor location, and toxicity of the pollutants are used in the risk assessment process. These assumptions are designed to err on the side of public health protection. The many assumptions used in the process limit the conclusions that can be drawn from the results. The results are not intended to predict actual adverse health impacts, but are used to characterize risk for comparison purposes. Typically, because conservative assumptions are used whenever specific data are unavailable, the

more refined the data used in a risk assessment are, the lower the resultant risk is. However, comparison of risk assessment results from different sources or facilities is valid only if the assumptions used are consistent. Most risk assessments are prepared according to state and federal guidelines in order to minimize any inconsistencies.

As discussed earlier, an increased cancer risk of more than 10 in 1 million and acute or chronic noncancer risks indicated by hazard indices greater than 1 are considered significant by many regulatory agencies.

Voluntary and Involuntary Health Risks - A Perspective

Risks are either voluntary and involuntary. Many of our actions carry a high degree of risk, yet are acceptable in society. For example, although cigarette smoking is extremely hazardous, some people accept the risks of smoking voluntarily. In contrast, second-hand smoke is an involuntary exposure and is not accepted by many individuals. Similarly, the risk attributable to toxic air contaminant emissions from a neighboring business is usually the result of involuntary exposure. As a result of increased awareness and concern over these involuntary risks, laws and regulations have been developed to reduce these risks, even if they are lower than some voluntary risks.

Methodology for Identifying Expected Types of Toxic Air Contaminant Emissions from the Proposed Project

Table V.F.6 in Section V.F, Air Quality, lists air emissions representative of those that could be released from Commercial Industrial uses and UCSF. This list assumes that UCSF operations at Mission Bay would be similar to UCSF operations at Parnassus Heights. It further assumes that emissions from Commercial Industrial uses would be similar to those of UCSF or of a representative life-science research and development company. In keeping with the methodology and rationale presented under "Hazardous Materials Use, Storage, and Disposal" in Section V.I, Health and Safety: Impacts, Chiron Corporation's biotechnology campus in Emeryville, California, appears to be representative of possible Commercial Industrial activities. The possible air emissions described in Table V.F.6 include volatile chemicals from within the broad categories described in Table V.I.4 and Appendix Table H.1. Many of these substances would be toxic air contaminants as a result of their acute or chronic (including carcinogenic) toxicities. A few of the substances listed in Table V.F.6 (e.g., alkanes and alkenes) are not toxic but, if emitted from project sources, could contribute to air pollution.

NOTES: Appendix E, Air Quality

1. California Department of Transportation, *Transportation Project-Level Carbon Monoxide Protocol*, August 1995.
2. CAPCOA Air Toxics "Hot Spots" 1992 Revised Risk Assessment Guidelines, October 1993.

F. NOISE AND VIBRATION

SOME BASIC ENVIRONMENTAL NOISE CONCEPTS

Sound is a form of energy transmitted via atmospheric pressure variations. Its most obvious characteristics are amplitude, which we perceive as loudness, and frequency, which we experience as pitch. The standard unit of sound amplitude is the **decibel** (dB). Most common sounds contain many different frequency components. Because the human ear is not equally sensitive to all frequencies, a frequency-dependent weighting scheme is imposed whenever sound is measured. **A-weighted decibels** (dBAs) handle a sound's frequency components in a manner approximating that of the human ear. Table F.1 provides examples of the A-weighted sound levels associated with common situations.

The judgment of the listener is crucial in discriminating between sound and noise; **noise** is simply sound that is unacceptable to the listener for a variety of reasons. Intense noise, as it is experienced in certain industrial and commercial settings (e.g., steel mills, airports), can cause physiological damage. In most instances of environmental exposure, noise effects are typically limited to subjective effects such as annoyance or dissatisfaction, interference with sleep, speech, recreation, and work performance. Unfortunately, there is no completely satisfactory way to measure subjective effects, primarily because of the wide variation in individual thresholds of annoyance, and in individual habituation to noise based on past experience. Surveys allow the establishment of criteria that reflect the range of community responses to noise and changes in noise level.

Many quantitative indicators have been developed to measure environmental noise. All reflect the consensus among researchers that there is a correlation between the adverse impacts of noise and its loudness. Some indicators consider the time of noise occurrence. Three of the commonly used indicators that have been used in this analysis of the environmental noise impacts of the proposed project are:

- **Equivalent energy noise level (L_{eq})** is the average acoustic energy content of noise for a stated period of time. The L_{eq} of two different time-varying noise events are the same if they deliver the same acoustic energy to the ear during exposure, no matter what time of the day or night they occur.
- **Day-night average noise level (L_{dn})** is a 24-hour average L_{eq} with a 10 dBA "penalty" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for the greater sensitivity of people to nighttime noises.
- **Community Noise Equivalent Level (CNEL)** is a 24-hour average very similar to the L_{dn} with an additional 5 dBA "penalty" added to noise during the evening hours of 7:00 p.m. to 10:00 p.m. to account for nighttime noise sensitivity.

TABLE F.1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

A-Weighted Sound Level in Decibels	Noise Environments and Sources	Subjective Impression
140		
130	100 Feet From a Civil Defense Siren	
120	200 Feet From a Jet Takeoff	Pain Threshold
110	In Rock Music Concert Hall	
100	50 Feet From a Pile Driver or 100 Feet From an Ambulance Siren	Very Loud
90	Boiler Room or 50 Feet From Freight Cars	
80	In Kitchen with Garbage Disposal Running or 50 Feet From a Pneumatic Drill	
70		Moderately Loud
60	10 Feet From a Vacuum Cleaner or in a Department Store	
50	Private Business Office or 100 Feet From Light Traffic 200 Feet From a Large Transformer	
40		Quiet
30	Quiet Bedroom or 5 Feet From a Soft Whisper	
20	Recording Studio	
10		Threshold of Hearing
0		

Note:

This table is meant to give the reader a sense of A-weighted sound levels by providing an example of a noise source or an environment corresponding to a certain noise level. For example, a person at a rock music concert would experience noise levels of 110 dBA; a person standing 200 feet from a jet takeoff would experience noise levels of 120 dBA.

Source: EIP Associates.

REGULATORY CONTEXT

Local noise policies relevant to the current project are described in “Regulatory Framework,” in Section V.G, Noise and Vibration: Setting. State and federal policies and criteria are described for informational purposes below. The current project is not specifically subject to these state and federal policies.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled scientific information on the effects of noise exposure and defined acceptable exposure levels to protect public health and welfare with a margin of safety. These protective exposure levels are expressed in terms of suggested limits on the 24-hour average L_{eq} (55 dBA for outdoor areas where people spend limited amounts of time, such as school yards and playgrounds) or the L_{dn} (55 dBA in residential areas and other outdoor places where quiet is a basis for use). It is important to note that “public health and welfare” is an indivisible term; there are no separate “health” effects or “welfare” effects. Thus “public health and welfare” includes personal comfort and well-being, and the absence of mental anguish, disturbances, and annoyance, as well as the absence of clinical symptoms such as hearing loss or demonstrable physiological injury.^{1/} The EPA-defined acceptable noise exposure levels are conservative; they were developed without consideration of technical or economic feasibility and represent levels below which there is no reason to suspect that the general population will be at risk from any of the identified effects of noise. Because the suggested noise levels that will protect public health and welfare were developed by the U.S. EPA without regard for economic or technical feasibility, they should not be viewed as regulatory criteria or goals, but as “levels below which there is no reason to suspect that the general population will be at risk from any of the identified effects of noise.”^{2/}

In order to limit population exposure to physically damaging and psychologically disruptive noise, the California Department of Health Services’ (DHS) Office of Noise Control has issued noise exposure guidelines that established three categories of noise exposure severity in the outdoor environment:

- Normally Acceptable (for residential uses and hospitals, an L_{dn} of 60 dBA or less) – no undue burden on affected receptors, needing no special noise insulation;
- Conditionally Acceptable (for residential uses and hospitals, an L_{dn} between 60 dBA and 75 dBA) – requires some noise insulation as established by an acoustic study to reduce interior noise; and
- Unacceptable (for residential uses and hospitals, an L_{dn} greater than 75 dBA) – noise exposure is so severe that it is not generally feasible to provide adequate insulation for acceptable interior noise levels.

The DHS guidelines serve as a model for use by counties and cities in the state. Most have changed the original DHS range specifications to some extent to suit their local conditions.

NOISE MEASUREMENTS IN AND AROUND THE PROJECT AREA

Table F.2 provides a summary of the noise measurements taken in and around the Project Area for this SEIR. The purpose of these measurements was to calibrate the SOUND32 model. Table V.G.1 presents the existing ambient noise levels based on SOUND32 modeling results.

VIBRATION

Typical levels of ground-borne vibration are shown in Figure F.1.

NOTES: Appendix F, Noise and Vibration

1. Protective Noise Levels: Condensed Version of EPA Levels Document, EPA 550/9-79-100, 1978.
2. Protective Noise Levels: Condensed Version of EPA Levels Document, EPA 550/9-79-100, 1978, p. 24.

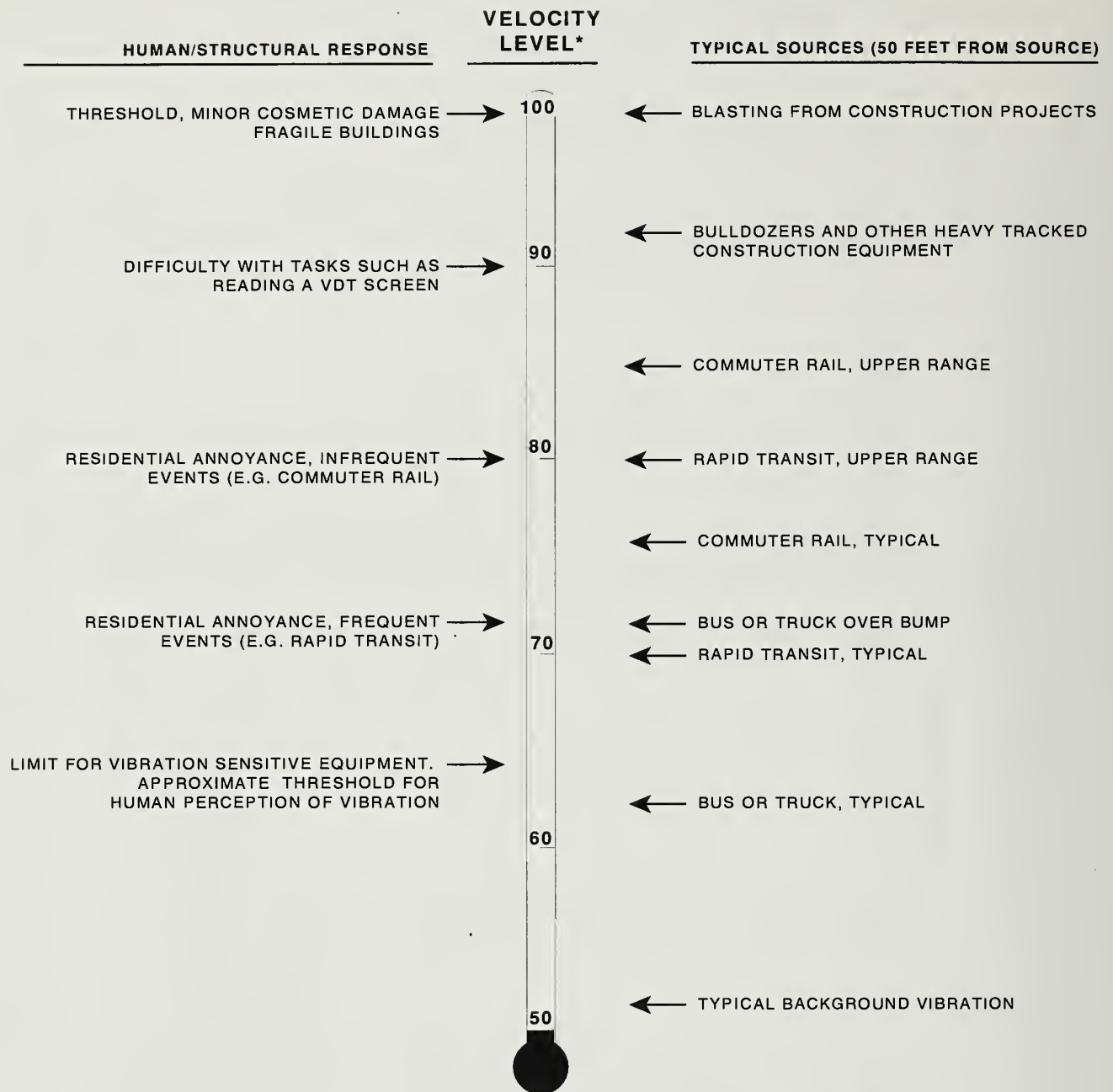
TABLE F.2
NOISE MEASUREMENT DATA SUMMARY/a/

Location Number /b/	Location Description	Measurement Period			Sound Levels (dBA)/c/	
		Date	Start Time	Duration	Influential Noise Source(s)	Leq Lmax
1.	Residential Receptor Pennsylvania St., south of Mariposa St.	8/31/97	16:00	10 min.	Traffic on Pennsylvania	67.5 81.5
2.	Residential Receptor Potrero Ave., south of 16th St.	8/31/97	17:05	10 min.	Traffic on Potrero	73.5 82.6
3.	Church (Sensitive Receptor) Mariposa St., west of De Haro St.	8/31/97	16:35	10 min.	Traffic on Mariposa	69.7 86.4
4.	Other Study Location Berry St., west of Fourth St.	12/11/97	17:30	15 min.	Traffic on Fourth Street	64.2 76.8
5.	Other Study Location Third St., south of Mission Rock St.	8/31/97	15:45	10 min.	Traffic on Third Street	70.1 82.1
6.	Other Study Location /d/ Sixth Street, south of Channel St.	12/11/97	17:50	15 min.	Traffic on Sixth Street	63.7 77.0
7.	Other Study Location Minnesota St. (and future Fourth St.) south of Mariposa St./e/	8/31/97	15:20	10 min.	Traffic on Fourth Street	72.1 81.0

Notes:

- All noise measurements were performed using a Larson Davis sound level meter, calibrated with a Quest CA-12B Sound Calibrator. The purpose of these measurements was to calibrate the SOUND32 model.
- Figure V.G.2 shows the locations of these sites.
- L_{eq} is the average noise intensity during the measurement period (10 minutes for these locations).
 L_{max} is the highest instantaneous noise intensity during the measurement period.
 L_{dn} is the 24-hour L_{eq} with a 10 dBA "penalty" added to nighttime noise.
- Field measurements were taken on Sixth Street, south of Channel Street. This would be the location of the future Common Street roundabout, south of the future location of Owens Street.
- The field data for this location were taken on the Minnesota Leg. These data were used to calibrate the model for the Mariposa and Fourth Street intersection.

Source: EIP Associates.



*RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second.

SOURCE: Office of Planning, Federal Transit Administration, U.S. Department of Transportation, Transit Noise and Vibration Impact Assessment Final Report, April 1995, p.7-5.

MISSION BAY SUBSEQUENT EIR

FIGURE F.1 TYPICAL LEVELS OF GROUND-BORNE VIBRATION

G. SEISMICITY

RELATIONSHIP OF THE CURRENT STUDY TO THE 1990 FINAL ENVIRONMENTAL IMPACT REPORT FOR THE MISSION BAY PROJECT AREA

The Geology & Seismicity section of Volume I, Chapter II of the 1990 FEIR is incorporated by reference in this SEIR, and the relevant text is summarized in this appendix.^{/1/} The Project Area being examined in this SEIR would occupy essentially the same area analyzed in the 1990 FEIR for the Mission Bay Project Area. Updated geologic and soils information is included in the Initial Study (Appendix A). Updated seismic information is included in the SEIR, and is cited in the endnotes of Section V.H, Seismicity, as well as in the endnotes of this appendix.

SUMMARY OF THE RELEVANT TEXT IN THE 1990 FINAL ENVIRONMENTAL IMPACT REPORT FOR THE MISSION BAY PROJECT AREA

The 1990 FEIR addresses settlement, foundation types, earthquakes, secondary earthquake hazards, earthquake damage, and measures to mitigate geo-seismic hazards throughout the Mission Bay Project Area. The inevitability of major earthquakes in the Bay Area, the exacerbation of seismic effects by artificial fill and Bay Mud underlying the Mission Bay Project Area, and the reduction of seismic hazards through the proper use of site-specific geo-seismic information in structural design are recognized in the context of the Mission Bay Project Area. The estimate (current in August 1990) of the time-frame in which a major earthquake is likely to occur is stated to be about 10% within the 20 years following 1984.^{/2/} This estimate has been superseded by information from studies by the United States Geological Survey following the 1989 Loma Prieta earthquake. The updated estimate is 67% in the 30-year period between 1990 and 2020.^{/3/}

The Settlement subsection of the 1990 FEIR briefly describes the stratigraphy underlying the Mission Bay Project Area as an artificially filled tidal inlet containing as much as 57 feet of unengineered fill (sand, clay, bricks, cinder, concrete rubble, trash) overlying 20 to 120 feet of wet, compressible Bay Mud, and 15 to 75 feet of older, more stable sediments (sandy clays and clayey sands). Depth to Franciscan bedrock ranges from 50 to 200 feet. Thickness of deposits and depth to bedrock increases toward the Bay. Several feet of settlement has occurred since filling began in the late 1800's, and is expected to continue at a reduced rate, causing as much as another 6 inches of total settlement during the next 30 years (1990 - 2020). Differential settlement has occurred where adjacent areas have been loaded more or less heavily with different weight structures or filled to different depths with compressible material. The central and eastern portions of the Mission Bay Project Area are judged most susceptible to differential settlement. Heavy loads from buildings placed directly on the fill near

China Basin squeezed Bay Mud from beneath the structures into unconfined areas at the water's edge, reducing water depth, hindering navigation, and causing further settlement./4/

The Foundations subsection of the 1990 FEIR briefly describes the two types of foundations that could be used in the Mission Bay Project Area, and the criteria for selecting the appropriate type. Piles driven to the more stable material beneath the Bay Mud would be needed to support the foundations of structures more than five stories high, or where total settlement is expected to exceed 6 inches. Pile supported structures would not settle. In areas not subject to excessive settlement, one- to two-story structures could be supported on spread footings or stiffened slabs: compensating foundations (concrete slabs that float on a layer of engineered fill) could be used for two- to five-story structures. Spread footing or slab supported structures would settle at the same rate as the surrounding area./5/

The Earthquakes subsection of the 1990 FEIR briefly describes the San Andreas Fault System, being the boundary between two plates of Earth's crust, as the source of earthquakes in the Bay Area. The pattern of increasing seismic activity prior to a great earthquake is noted, as is the possibility that the Bay Area is entering another cycle of such activity. The most damage in San Francisco during the October 1989 Loma Prieta earthquake was caused in areas of filled land along the northern and eastern edges of the City. A maximum credible earthquake in the San Andreas Fault System would produce very strong to violent groundshaking in the Mission Bay Project Area./6/

The Secondary Earthquakes Hazards subsection of the 1990 FEIR describes the earthquake-induced ground failures that probably would occur in the Mission Bay Project Area. These include liquefaction, subsidence, and lateral spreading, all resulting from seismic vibration of saturated loose soil (Younger Bay Mud) or fill. Except for the northeast corner of the Mission Bay Project Area, where bedrock is exposed, all parts of the area had some potential for liquefaction and subsidence, with the greatest risk being north of China Basin Channel. The risk of lateral spreading is greatest within several hundred feet of China Basin Channel./7/

The Earthquake Damage subsection of the 1990 FEIR ranks various building types according to the damage they are expected to sustain during a major earthquake. Well-designed and carefully constructed buildings are not expected to collapse, but damage would range from slight, in light metal and wood frame structures, to severe, in tilt-up concrete structures. Damage is expected in all infrastructure (roads, bridges, pipelines, etc.), and access to the Mission Bay Project Area is expected to be limited, particularly south of China Basin Channel. Shattering windows and falling debris are expected to be the major source of injuries or deaths, the number of casualties depending on the

number of people in the Mission Bay Project Area, and the time of day when the earthquake occurs./8/

The Mitigation Measures subsection of the 1990 FEIR states that measures are included in the Mission Bay project to eliminate, reduce, or avoid geo-seismic effects. These measures subsequently were incorporated into the *Mission Bay Monitoring Program* (September 20, 1990) as requirements for any development in the Mission Bay Project Area./9/ Implementation of the mitigation measures is the core of the mitigation program for the development of the Mission Bay Project Area as envisioned in the 1990 FEIR. The content of the measure is listed briefly in the following paragraphs. Many of these measures have been incorporated in the 1995 San Francisco Building Code and are required as part of all development projects in the City and County's or the Redevelopment Agency's jurisdiction. Some others have been incorporated in the 1997 Uniform Building Code and have been adopted by Catellus although they are not yet required by the San Francisco Building Code.

As envisioned in the 1990 FEIR, five measures to reduce or eliminate the effects of settlement would require soil engineering investigations, pile-supported or other appropriate foundations, reuse of existing piles where possible, leveling jacks or similar techniques for buildings with shallow foundations, and surcharging and draining of building sites where necessary. Basements would be constructed above the water table, thereby eliminating the need for dewatering. Drainage systems would be designed to accommodate settlement. Corrosive soils would be located and neutralized. The then-current San Francisco Building Code would be the minimum standard required to withstand seismic groundshaking.

Five other measures would reduce groundshaking hazards by restricting exterior building materials to less hazardous types, requiring peer review to ensure the use of state-of-the-art engineering practices, securing material and equipment in buildings under construction, requiring a certified Quality Assurance/Quality Control program for construction and materials, and requiring bracing of nonstructural building elements. Sandy soil would be compacted to reduce liquefaction potential. Automatic shut-off devices would be required on natural gas lines.

Five measures would improve emergency response by requiring an emergency response plan for the Mission Bay Project Area, specifying siting and design features for emergency facilities, requiring a mass care facility in the Mission Bay Project Area, installing cisterns and suction hydrants for bay water to increase fire-fighting capabilities, and storing heavy equipment within the Project Area to provide transport, to open access, and to clear debris after a major earthquake./10/

NOTES: Appendix G, Seismicity

1. San Francisco Planning Department, *Mission Bay Final Environmental Impact Report*, Planning Department File No. 86.505E, State Clearinghouse No. 86070113, certified August 23, 1990, Volume Two, Technical Analyses, Chapter VI, "Environmental Setting, Impact & Mitigation," Section K, Geology and Seismicity, pp. VI.K.1-VI.K.61.*
2. *1990 FEIR*, Volume One, p. II.76.*
3. Working Group on California Earthquake Probabilities, *Probabilities of Large Earthquakes in the San Francisco Bay Region, California*, United States Geological Survey Circular 1053, 1990, p. 29.
4. *1990 FEIR*, Volume One, pp. II.76 and II.77.*
5. *1990 FEIR*, Volume One, p. II.77.*
6. *1990 FEIR*, Volume One, pp. II.77 and II.78.*
7. *1990 FEIR*, Volume One, pp. II.78 and II.79.*
8. *1990 FEIR*, Volume One, pp. II.79 and II.80.*
9. San Francisco Planning Commission, *Mission Bay Master Plan*, File No. 86.505M, Resolution No. 12040, adopted September 27, 1990, Development Agreement Exhibit A-5 Mission Bay Monitoring Program, September 20, 1990, pp. A-30-A-44.*
10. *1990 FEIR*, Volume One, pp. II.80 and II.81.*

* A copy of this report is on file for public review at the Office of Environmental Review, Planning Department, 1660 Mission Street, San Francisco.

H. HEALTH AND SAFETY

This appendix contains supporting documentation to accompany Section V.I, Health and Safety. It is presented in parts:

- Definitions
- Examples of Laboratory Chemicals and Infectious Agents
- Regulatory Setting
- Standard Industry Practices
- Hazard Assessment

After defining “hazardous materials” and other terms used in this report, this appendix provides examples of the types of hazardous materials and infectious agents that could be handled by Commercial Industrial uses and UCSF. Because laws and regulations serve to control many potential health and safety hazards, this appendix summarizes the laws and regulations applicable to the project in more detail than provided in Section V.I, Health and Safety. Similarly, standard industry practices address some issues for which few or no laws or regulations apply; therefore, these standards are summarized following the detailed regulatory setting. This appendix ends with a hazard assessment that describes how applicable laws, regulations, and standards serve to control environmental impacts, and discusses areas where reliance on these laws, regulations, and standards may not adequately address certain issues. The hazard assessment is intended to provide sufficient background information to allow Section V.I, Health and Safety, to focus on issues of primary importance.

DEFINITIONS

For purposes of this SEIR, hazardous materials include hazardous chemicals, radioactive materials, and biohazardous agents, although these materials are often subject to different regulatory schemes. The term “hazardous material” is defined differently for different regulatory programs, but for this report, the definition is similar to that given in the California Health and Safety Code./1/

- *Hazardous materials* are materials that, due to their quantity, concentration, or physical or chemical characteristics, pose a significant hazard to human health and safety, or to the environment, if released into the workplace or the environment.

The definition of hazardous waste, which is a subset of hazardous material, is similar to that given in both the California Health and Safety Code and the California Code of Regulations./2/

- **Hazardous wastes** are wastes that, due to their quantity, concentration, or physical, chemical, or infectious characteristics, may either 1) increase mortality or serious illness, or 2) pose a substantial hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Hazardous waste includes any hazardous material that is discarded by such means as abandonment, disposal, or recycling./3/ The characteristics of hazardous materials and wastes are described further in the 1990 FEIR./4/

Terminology related to radioactive materials is discussed below.

- **Radioactive materials** contain atoms with unstable nuclei that spontaneously emit ionizing radiation to increase their stability.
- **Radioactive wastes** are radioactive materials that are discarded (including wastes in storage) or abandoned.

Radioactive atoms are called *radionuclides*. When a radionuclide emits radiation, it eventually becomes nonradioactive. The level of radioactivity decreases by one half after a period called a *half-life*. The half-lives of some radionuclides commonly used in laboratories are as follows: tritium (hydrogen-3 or ^3H), 12 years; phosphorus-32 (^{32}P), 14 days; carbon-14 (^{14}C), 5,700 years; iodine-125 (^{125}I), 60 days; and sulfur-35 (^{35}S), 88 days./5/ Radioactive materials with half-lives greater than 90 days are *long-lived radionuclides*; those with half-lives less than 90 days are *short-lived radionuclides*.

Terminology related to biohazardous materials is discussed below.

- **Biohazardous materials** are materials containing infectious agents that require Biosafety Level 2 or greater safety precautions or cells containing recombinant DNA molecules with codes that can be expressed to create a protein.

Infectious agents are microorganisms, bacteria, molds, parasites, or viruses that normally increase human mortality and include organisms capable of being communicated by invading and multiplying in body tissues./6/ *Biosafety levels* are levels of safety precautions defined by the U.S. Department of Health and Human Services for work with biological materials./7/ As described below under "Standard Industry Practices," four levels exist, Biosafety Levels 1 to 4, with Biosafety Level 1 being appropriate for the least hazardous biological materials. *Recombinant DNA* is DNA (deoxyribonucleic acid, the molecule that stores genetic information) made outside a living cell by joining natural or synthetic DNA together with DNA that a living cell can copy. All copies of such DNA are also considered recombinant.

- **Medical waste** is waste resulting from the diagnosis, treatment, or immunization of human beings or animals; research pertaining to these activities; or the production of biologics (naturally occurring therapeutic pharmaceutical products or their derivatives)./8/

For purposes of this SEIR, medical waste is a special type of hazardous waste that includes both *biohazardous waste* and *sharps waste* (items capable of cutting or piercing, such as hypodermic needles, razor blades, and broken glass, that may be contaminated with biohazardous material). With this definition, medical waste is not necessarily limited to wastes coming from medical facilities. However, medical waste *does not* include waste containing microbiological cultures associated with food processing or biotechnology that is not otherwise considered infectious.

EXAMPLES OF LABORATORY CHEMICALS AND INFECTIOUS AGENTS

As discussed under “Estimated Hazardous Materials Quantities” under “Hazardous Materials Use, Storage, and Disposal” in Section V.I, Health and Safety: Impacts, Commercial Industrial research and development in the Project Area would most likely relate to the life sciences as a result of the proximity of UCSF. Tables H.1 and H.2 list examples of laboratory chemicals and infectious agents similar to those that could be used by Commercial Industrial businesses and UCSF. The risk groups identified in Table H.2 generally correspond to biosafety levels.

Other types of research and development would be possible in Commercial Industrial areas, and these types of research and development could involve greater hazardous chemical use. For comparison, Table H.3 presents estimated chemical storage by Commercial Industrial uses and UCSF assuming that almost all Commercial Industrial research and development would relate to computer, semiconductor, and other “high tech” industries. The estimated quantities presented in Table H.3 are unlikely to be found in the Project Area, but Table H.3 does illustrate how hazardous chemical use varies with different types of research and development. Table H.3 contrasts with Table V.I.4, which assumes research and development would relate to the biological sciences. Chemical use tends to be greater in Table H.3; however, the estimates presented in Table V.I.4 are believed to be conservatively representative of likely project conditions.

The approach used to develop Table H.3 is the same as described in “Approach Used to Estimate Hazardous Materials Quantities” under “Hazardous Materials Use, Storage, and Disposal in Section V.I, Health and Safety: Impacts, except that data from Hewlett Packard Laboratories in Palo Alto, California, were used instead of data from Chiron Corporation in Emeryville. On the basis of the Hewlett Packard Laboratories data, Commercial Industrial activities in the Project Area could, in addition to the chemicals listed in Table H.3, involve up to 100,000 gallons of cryogenic (very cold) liquids, 6,800 cubic feet of flammable gases, 39,000 cubic feet of toxic gases, and 250,000 cubic feet

TABLE H.1
EXAMPLES OF LABORATORY CHEMICALS, BY TYPE

Flammable Materials

acetone	isopropanol
acetonitrile	2,6-lutidine
benzene	2-mercapto-ethanol
butanol	methanol
dimethylformamide	piperidine
1,4-dioxane	1-propanol
ethanol	pyridine
ether	sodium borohydride
ethyl acetate	sodium hydride
ethylene glycol	tetrahydrofuran
hexane	toluene
isoamyl alcohol	triethylamine
isobutanol	xylene

Corrosive Materials

acetic anhydride	phosphoric acid
ammonia	potassium hydroxide
ethylene diamine	sodium bisulfite
formic acid	sodium hydroxide
glacial acetic acid	sodium phosphate dibasic
hydrochloric acid	sodium phosphate tribasic
hydroxylamine hydrochloride	succinic acid
lactic acid	sulfuric acid
nitric acid	trichloroacetic acid
oxalic acid	trifluoroacetic acid

Oxidizers

ammonium persulfate	potassium permanganate
hydrogen peroxide	silver nitrate
perchloric acid	sodium nitrite
periodic acid	sodium perchlorate

(Continued)

TABLE H.1 (Continued)

Toxic Substances

acrylamide	imidazole
benzyl alcohol	isopropyl-D-thiogalactopyranoside
cacodylic acid	methyl sulfoxide
cesium chloride	methylene blue
chloroquinine	morpholinoethane sulfonic acid
coomasie brilliant blue	N,N-methylene-bis-acrylamide
cyanogen bromide	N-tris-hydroxymethylmethylglycine
deoxycholic acid	ninhydrin
dimethylsulfoxide	phenol
diphenylamine	phenylmethylsulfonyl flouride
formamide	piperazine-N,N'-bis-2-ethanesulfonic acid
glycerol	potassium thiocyanate
guanidine hydrochloride	sodium azide
guanidine thiocyanate	sodium cyanoborohydride
1,1,1,3,3,3-hexafluoro-2-propanol	sodium thiocyanate
8-hydroxyquinoline	streptomycin sulfate

Other Materials

amino acids	formaldehyde
ammonium acetate	mineral oil
ampicillin	phosphoramidite
ascorbic acid	polyethylene glycol
bleach	potassium dichromate
bromophenyl blue	potassium phosphate
chloroform	silica gel
citric acid	sodium bicarbonate
cobalt chloride	sodium carbonate
cupric sulfate	sodium chloride
dextran	sodium dodecylsulfate
dichloromethane	tetramethylethylenediamine
dithiothreitol	tris-hydroxymethylaminomethane
ethidium bromide	

Source: EIP Associates, based on information from City of Emeryville, *Chiron Development Plan Environmental Impact Report*, State Clearinghouse No. 94063005, June 1995.

TABLE H.2
BASIS FOR THE CLASSIFICATION OF BIOHAZARDOUS AGENTS BY RISK GROUP

Risk Group 1

Agents that are not associated with disease in healthy adult humans.

asporogenic *Bacillus subtilis*
Bacillus licheniformis
Escherichia coli-K12
adeno-associated virus types 1 through 4

Risk Group 2

Agents that are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are *often* available.

Bacterial Agents, Including Chlamydia

Acinetobacter baumannii (formerly *Acinetobacter calcoaceticus*)
Actinobacillus
Actinomyces pyogenes (formerly *Corynebacterium pyogenes*)
Aeromonas hydrophila
Amycolata autotrophica
Archanobacterium haemolyticum (formerly *Corynebacterium haemolyticum*)
Arizona hinshawii - all serotypes
Bacillus anthracis
Bartonella henselae, *B. quintana*, *B. vinsonii*
Bordetella including *B. pertussis*
Borrelia recurrentis, *B. burgdorferi*
Burkholderia (formerly *Pseudomonas* species) except those listed for risk group 3
Campylobacter coli, *C. fetus*, *C. jejuni*
Chlamydia psittaci, *C. trachomatis*, *C. pneumoniae*
Clostridium botulinum, *Cl. chauvoei*, *Cl. haemolyticum*, *Cl. histolyticum*, *Cl. novyi*, *Cl. septicum*, *Cl. tetani*
Corynebacterium diphtheriae, *C. pseudotuberculosis*, *C. renale*
Dermatophilus congolensis
Edwardsiella tarda
Erysipelothrix rhusiopathiae
Escherichia coli - all enteropathogenic, enterotoxigenic, enteroinvasive and strains bearing K1 antigen, including *E. coli* O157:H7
Haemophilus ducreyi, *H. influenzae*
Helicobacter pylori
Klebsiella - all species except *K. oxytoca* (risk group 1)
Legionella including *L. pneumophila*
Leptospira interrogans - all serotypes

(Continued)

TABLE H.2 (Continued)

Listeria

Moraxella

Mycobacterium (except those listed for risk group 3) including *M. avium* complex, *M. asiaticum*, *M. bovis* BCG vaccine strain, *M. chelonae*, *M. Fortuitum*, *M. kansasii*, *M. leprae*, *M. malmoense*, *M. marinum*, *M. paratuberculosis*, *M. scrofulaceum*, *M. simiae*, *M. szulgai*, *M. ulcerans*, *M. xenopi*

Mycoplasma, except *M. mycoides* and *M. agalactiae* which are restricted animal pathogens

Neisseria gonorrhoea, *N. meningitidis*

Nocardia asteroides, *N. brasiliensis*, *N. otitiscaviarum*, *N. transvalensis*

Rhodococcus equi

Salmonella including *S. arizonae*, *S. choleraesuis*, *S. enteritidis*, *S. gallinarum-pullorum*, *S. meleagridis*, *S. paratyphi*, A, B, C, *S. typhi*, *S. typhimurium*

Shigella including *S. boydii*, *S. dysenteriae*, type 1, *S. flexneri*, *S. sonnei*

Sphaerophorus necrophorus

Staphylococcus aureus

Streptobacillus moniliformis

Streptococcus including *S. pneumoniae*, *S. pyogenes*

Treponema pallidum, *T. carateum*

Vibrio cholerae, *V. parahemolyticus*, *V. vulnificus*

Yersinia enterocolitica

Fungal Agents

Blastomyces dermatitidis

Cladosporium bantianum, *C. (Xylohypha) trichoides*

Cryptococcus neoformans

Dactylaria galopava (Ochroconis gallopavum)

Epidermophyton

Exophiala (Wangiella) dermatitidis

Fonsecaea pedrosoi

Microsporum

Paracoccidioides brasiliensis

Penicillium marneffeii

Sporothrix schenckii

Trichophyton

Parasitic Agents

Ancylostoma human hookworms including *A. duodenale*, *A. ceylanicum*

Ascaris including *Ascaris lumbricoides suum*

Babesia including *B. divergens*, *B. microti*

Brugia filaria worms including *B. malayi*, *B. timori*

Coccidia

(Continued)

TABLE H.2 (Continued)

<i>Cryptosporidium</i> including <i>C. parvum</i>
<i>Cysticercus cellulosae</i> (hydatid cyst, larva of <i>T. solium</i>)
<i>Echinococcus</i> including <i>E. granulosus</i> , <i>E. multilocularis</i> , <i>E. vogeli</i>
<i>Entamoeba histolytica</i>
<i>Enterobius</i>
<i>Fasciola</i> including <i>F. gigantica</i> , <i>F. hepatica</i>
<i>Giardia</i> including <i>G. lamblia</i>
<i>Heterophytes</i>
<i>Hymenolepis</i> including <i>H. diminuta</i> , <i>H. nana</i>
<i>Isospora</i>
<i>Leishmania</i> including <i>L. braziliensis</i> , <i>L. donovani</i> , <i>L. ethiopia</i> , <i>L. major</i> , <i>L. mexicana</i> , <i>L. peruviana</i> , <i>L. tropica</i>
<i>Loa loa</i> filaria worms
<i>Microsporidium</i>
<i>Naegleria fowleri</i>
<i>Necator</i> human hookworms including <i>N. americanus</i>
<i>Onchoerca</i> filaria worms including <i>O. volvulus</i>
<i>Plasmodium</i> including simian species, <i>P. cynomologi</i> , <i>P. falciparum</i> , <i>P. malariae</i> , <i>P. ovale</i> , <i>P. vivax</i>
<i>Sarcocystis</i> including <i>S. sui hominis</i>
<i>Schistosoma</i> including <i>S. haematobium</i> , <i>S. intercalatum</i> , <i>S. japonicum</i> , <i>S. mansoni</i> , <i>S. mekongi</i>
<i>Strongyloides</i> including <i>S. stercoralis</i>
<i>Taenia solium</i>
<i>Toxocara</i> including <i>T. canis</i>
<i>Toxoplasma</i> including <i>T. gondii</i>
<i>Trichinella spiralis</i>
<i>Trypanosoma</i> including <i>T. brucei brucei</i> , <i>T. brucei gambiense</i> , <i>T. brucei rhodesiense</i> , <i>T. cruzi</i>
<i>Wuchereria bancrofti</i> filaria worms

Viruses

Adenoviruses, human - all types
Alphaviruses (Togaviruses) - Group A Arboviruses
Eastern equine encephalomyelitis virus
Venezuelan equine encephalomyelitis vaccine strain TC-83
Western equine encephalomyelitis virus
Arenaviruses
Lymphocytic choriomeningitis virus (non-neurotropic strains)
Tacaribe virus complex

(Continued)

TABLE H.2 (Continued)

Bunyaviruses
Bunyamwera virus
Rift Valley fever virus vaccine strain MP-12
Caliciviruses
Coronaviruses
Flaviviruses (Togaviruses) - Group B Arboviruses
Dengue virus serotypes 1, 2, 3, and 4
Yellow fever virus vaccine strain 17D
Hepatitis A, B, C, D, and E viruses
Herpesviruses - except <i>Herpesvirus simiae</i> (Monkey B virus)
Cytomegalovirus
Epstein Barr virus
Herpes simplex types 1 and 2
Herpes zoster
Human herpesvirus types 6 and 7
Othomyxoviruses
Influenza viruses types A, B, and C
Papovaviruses - All human papilloma viruses
Paramyxoviruses
Newcastle disease virus
Measles virus
Mumps virus
Parainfluenza virus types 1, 2, 3, and 4
Respiratory syncytial virus
Parvoviruses
Human parvovirus (B19)
Picornaviruses
Coxsackie viruses types A and B
Echoviruses - all types
Polioviruses - all types, wild and attenuated
Rhinoviruses - all types
Poxviruses - all types except Monkeypox virus and restricted poxviruses including Alastrim, Smallpox, and Whitepox
Reoviruses - all types including Coltivirus, human Rotavirus, and Orbivirus (Colorado tick fever virus)
Rhabdoviruses
Rabies virus - all strains
Vesicular stomatitis virus - laboratory adapted strains including VSV-Indiana, San Juan, and Glasgow
Togaviruses (see Alphaviruses and Flaviviruses)
Rubivirus (rubella)

(Continued)

TABLE H.2 (Continued)

Risk Group 3

Agents that are associated with serious or lethal human disease for which preventive or therapeutic interventions may be available.

Bacterial Agents, Including Rickettsia

Bartonella
Brucella including *B. abortus*, *B. canis*, *B. suis*
Burkholderia (Pseudomonas) mallei, *B. pseudomallei*
Coxiella burnetii
Francisella tularensis
Mycobacterium bovis (except BCG strain), *M. tuberculosis*
Pasteurella multocida type B - "buffalo" and other virulent strains
Rickettsia akari, *R. australis*, *R. canada*, *R. conorii*, *R. prowazekii*, *R. rickettsii*, *R. siberica*, *R. tsutsugamushi*, *R. typhi* (*R. mooseri*).
Yersinia pestis

Fungal Agents

Coccidioides immitis (sporulating cultures; contaminated soil)
Histoplasma capsulatum, *H. capsulatum* var.. *duboisii*

Viruses and Prions

Alphaviruses (Togaviruses) - Group A Arboviruses
 Semliki Forest virus
 St. Louis encephalitis virus
 Venezuelan equine encephalomyelitis virus (except the vaccine strain TC-83)
Arenaviruses
 Lymphocytic choriomeningitis virus (LCM) (neurotropic strains)
Bunyaviruses
 Hantaviruses including Hantaan virus
 Rift Valley fever virus
Flaviviruses (Togaviruses) - Group B Arboviruses
 Japanese encephalitis virus
 Yellow fever virus
Poxviruses
 Monkeypox virus
Prions
 Transmissible spongiform encephalopathies (TME) agents (Creutzfeldt-Jacob disease and kuru agents)

(Continued)

TABLE H.2 (Continued)

Retroviruses

- Human immunodeficiency virus (HIV) types 1 and 2
- Human T cell lymphotropic virus (HTLV) types 1 and 2
- Simian immunodeficiency virus (SIV)

Rhabdoviruses

- Vesicular stomatitis virus

Source: U.S. Department of Health and Human Services National Institutes of Health, *Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines)*, January 1996, pp. 30-34.

of other compressed gases (assuming “high tech” laboratories would occupy 75% of the Commercial Industrial space). Health and safety issues related to all of these types of materials are addressed in Section V.I, Health and Safety: Impacts, as well as here in Appendix H. Risk Management Plan requirements could apply to the use of some of these compressed gases.

REGULATORY SETTING

Hazardous materials handling is subject to numerous federal, state, and local laws and regulations. Although the summary of laws and regulations provided below is not exhaustive, it includes those most important to the storage, use, and disposal of hazardous chemicals, radioactive materials, and biological materials.

Occupational Safety

The California Division of Occupational Safety and Health (Cal/OSHA) and the Federal Occupational Safety and Health Administration (Fed/OSHA) are the agencies responsible for ensuring worker safety in the handling and use of chemicals in the workplace. Under the authority of the Occupational Safety and Health Act of 1970, Fed/OSHA has adopted numerous regulations pertaining to worker safety. These regulations set standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries. Fed/OSHA regulations also contain standards relating to hazardous materials handling, including workplace conditions, employee protection requirements, first aid, and fire protection.

In California, Cal/OSHA assumes primary responsibility for developing and enforcing workplace safety regulations. Because California has a federally approved OSHA program, it is required to

TABLE H.3
ESTIMATED CHEMICAL STORAGE
BY COMMERCIAL INDUSTRIAL USES AND UCSF (Assuming Commercial Industrial
Operations Primarily Related to "High Tech" Industries)

Chemical Type	Chemical Storage (assuming "high tech" labs occupy 50% of the Commercial Industrial space (tons) /a/	Chemical Storage (assuming "high tech" labs occupy 75% of the Commercial Industrial space (tons) /a/
Flammable Materials (materials that can sustain a fire if ignited)	450	670
Corrosive Materials (acidic or basic materials, which can corrode living tissue and other materials)	360	540
Oxidizers (reactive materials that often release oxygen upon reaction)	24	36
Toxic Substances	3.7	5.6
Other Materials /b/	4.0	5.9
Commercial Industrial Subtotal	840	1,300
UCSF	250	250
TOTAL	1,100	1,500

Notes:

- All figures have been rounded to two significant figures.
- The "other materials" category could include some materials that are not hazardous.

Sources: EIP Associates, based on information from Hewlett Packard Laboratories, Palo Alto, California, Hazardous Materials Management Plans on file with the City of Palo Alto Fire Department, 1997, and John Shaver, UCSF Office of Environmental Health and Safety, data provided to Michelle Schaefer, Campus Planning Office, February 13, 1998.

adopt regulations that are at least as strict as federal requirements. Cal/OSHA regulations concerning the use of hazardous materials in the workplace require employee safety training, safety equipment, accident and illness prevention programs, hazardous materials exposure warnings, and emergency action plan and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations, which contain training and information requirements, including procedures for identifying

and labeling hazardous materials. The hazard communication program regulations also require that Material Safety Data Sheets (forms provided by manufacturers that identify and describe the hazardous constituents in their products) be available to employees and that employee information and training programs be documented. These regulations also require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, and training in emergency evacuations).

Federal, state, and local laws include special provisions for hazard communication to employees in research laboratories, including training in chemical work practices. Chemical safety information must be available. Specific, more detailed training and monitoring is required for the use of carcinogens, ethylene oxide, lead, asbestos, and certain other chemicals. Both Fed/OSHA and Cal/OSHA have adopted Centers for Disease Control guidelines for safely handling specimens potentially infected with human bloodborne pathogens (disease-causing agents). The federal Occupational Exposure to Bloodborne Pathogens Standard requires the use of Universal Precautions in the workplace, which means all human blood and certain body fluids are to be handled as if they contain infectious agents, whether or not they do.

Hazardous Materials Management

State law requires detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and to prevent or minimize injury to human health or the environment in the event that such materials are accidentally released. Federal laws, such as the Emergency Planning and Community-Right-to-Know Act of 1986, impose similar requirements. Because state law regarding hazardous materials management is generally more stringent than federal law, state law is emphasized below. For the most part, state laws are enforced by local agencies. In San Francisco, the local authority is the San Francisco Department of Public Health. As a Certified Unified Permitting Agency, it implements a variety of hazardous materials programs, including underground and above-ground storage tank requirements, hazardous waste generation and treatment permitting, and Risk Management Plans.

The Hazardous Materials Release Response Plans and Inventory Law of 1985 (Business Plan Act), which is implemented locally as part of San Francisco's Hazardous Materials Permit and Disclosure Ordinance, requires businesses that handle hazardous materials to document details of the facility, including floor plans, and business conducted at the site; the inventory of hazardous materials that are handled or stored on site; an emergency response plan; and safety and emergency response training for employees. San Francisco's ordinance establishes a system for processing hazardous material storage permits and monitoring the use and disposal of hazardous materials. The process provides for

hazardous material identification, disclosure, and management plans, and intergovernmental notification and review of permits. The ordinance regulates the storage and labeling of hazardous materials, and specifies procedures for the installation, modification, and closure of hazardous materials storage facilities. These locally implemented requirements apply to state agencies, including UCSF.

In addition to the programs described above, businesses that use more than specified quantities of certain regulated substances (materials that pose extraordinary risks in the event of an accident, as defined by Health and Safety Code Section 25532[g]) must prepare Risk Management Plans. Because a significant number of facilities generate, store, treat, handle, refine, process, and transport hazardous materials, the California Legislature has recognized that, because of the nature and volume of chemicals handled at some facilities, their operations may represent a threat to public health and safety in the event of an accidental release.^{/9/} The potential for explosions, fires, or releases of toxic chemicals into the environment exists. The protection of the public from uncontrolled releases or explosions of hazardous materials is of statewide concern. According to the Legislature, there is an increasing capacity to both minimize and respond to releases of toxic air contaminants and hazardous materials once they occur, and to formulate efficient plans to evacuate citizens if these discharges or releases cannot be contained. However, programs designed to prevent these accidents are the most effective way to protect the community health and safety and the environment. These programs should anticipate the circumstances that could result in explosions, fires, or releases and require the taking of necessary precautionary and preemptive actions, consistent with the nature of the hazardous materials handled by the facility and the surrounding environment. As part of the Risk Management Plan process, a business must undertake a hazards analysis that systematically assesses the operations of the business to determine the potential for releases. Risk Management Plans must 1) estimate the consequences of a worst case accident scenario, 2) describe measures the business will take to reduce potential hazards, and, because they are public documents, 3) notify neighboring residents and businesses of the risks posed to them. In California, the public must be given an opportunity to review Risk Management Plans before administering agencies can approve them. The level of detail required in a Risk Management Plan is determined in consultation with the administering agency (in this case, the San Francisco Department of Public Health). The level of detail must be sufficient for the administering agency to determine that the Risk Management Plan satisfies state and federal requirements.

Pursuant to the Emergency Services Act, California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local governmental agencies and private citizens. Response to hazardous materials incidents is one part of this plan administered by the state Office of Emergency Services. The Office of Emergency Services coordinates the responses of other

agencies, including the San Francisco Public Health and Fire Departments. Local agencies are required to develop area plans for response to releases of hazardous materials and wastes. San Francisco's area plan addresses pre-emergency planning, describes agency notification and coordination procedures, specifies personnel training, and lists supplies and equipment.

Building and Fire Safety

The San Francisco Municipal Code includes a Building Code and a Fire Code. These codes amend and otherwise incorporate the California Building Code and California Fire Code. The California codes, in turn, are based on the Uniform Building Code and the Uniform Fire Code. The San Francisco Fire Code specifies management practices for combustible materials, including flammable and explosive hazardous materials. For example, this code specifies the types of containers that can hold flammable materials and how these containers must be stored (e.g., in fire safety cabinets). The Fire Code also addresses appropriate fire abatement systems (e.g., fire alarms and sprinklers). The San Francisco Building Code defines building occupancy classifications on the basis of intended building uses. Occupancy classifications account for the quantity of hazardous material to be handled in an area and the number and types of individuals occupying the space. The San Francisco Building Code specifies appropriate separations (fire-resistive walls) to be constructed between portions of a building falling into different occupancy classifications. The San Francisco Fire Department and Department of Building Inspection review design plans for new buildings to ensure compliance with Fire Code and Building Code requirements.

As a state institution, UCSF must comply with the California Fire Code as enforced by the State Fire Marshal. UCSF must also comply with the California Building Code.

Hazardous Waste Management

The federal Resource Conservation and Recovery Act of 1976 creates a "cradle to grave" hazardous materials regulatory program administered by the U.S. Environmental Protection Agency (EPA). Under this law, individual states may implement their own hazardous waste programs in lieu of the federal program, as long as the state program is at least as stringent as federal requirements. EPA must approve state programs intended to implement federal regulations, and it has approved California's program.

Under California's Hazardous Waste Control Law, administered by the California Environmental Protection Agency's Department of Toxic Substances Control, California has adopted regulations governing the generation, transportation, treatment, storage, and disposal of hazardous waste. These

hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; prescribe management methods for hazardous wastes; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. When transporting hazardous wastes, a hazardous waste manifest must accompany the shipment, describing the waste and its intended destination. A copy of each manifest must be filed with the Department of Toxic Substances Control, and the generator must match copies of hazardous waste manifests with receipts from treatment, storage, and disposal facilities.

Hazardous Materials Transportation

The U.S. Department of Transportation has the regulatory responsibility for the safe transportation of hazardous materials. Department of Transportation regulations govern all means of transportation, except for those packages shipped by mail, which are covered by U.S. Postal Service regulations. The State of California has also adopted the Department of Transportation regulations for the intrastate movement of hazardous materials.

The U.S. Environmental Protection Agency sets standards for transporters of hazardous waste, and the State of California regulates the transportation of hazardous waste originating in the state or passing through the state. The California Highway Patrol and the California Department of Transportation have primary responsibility for enforcing federal and state transportation regulations, and for responding to hazardous materials transportation emergencies. To prevent leakage and spills of material in transit and to provide detailed information to cleanup crews in the event of an accident, the California Highway Patrol enforces hazardous materials and hazardous waste labeling and packing regulations. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are the responsibility of the California Highway Patrol, which conducts regular inspections of licensed transporters to enforce regulatory compliance.

Common carriers conduct a large portion of their business in the delivery of hazardous materials. They are licensed by the California Highway Patrol, pursuant to the California Vehicle Code, which requires licensing of motor carriers who transport hazardous materials of the type requiring placards. Some Department of Transportation and U.S. Postal Service regulations apply to non-waste hazardous materials, but requirements for hazardous waste are more stringent. Hazardous waste packages must undergo tests that imitate some of the possible rigors of travel. While not every package must be put through every test, most packages must be able to be 1) kept under running water for a time without leaking; 2) dropped, fully loaded, onto a concrete floor; 3) compressed from both sides for a period of time; 4) subjected to low and high pressure; and 5) frozen and heated alternately. Biohazardous

materials packages must provide secondary containment with shock absorbent material between containers. Radioactive materials packages must be constructed to provide appropriate shielding from radiation.

Radioactive Materials

The federal Atomic Energy Act applies to the use and control of radioactive material, and provides for states to be responsible for the use, transportation, and disposal of low-level radioactive material. California has accepted responsibility for the protection of the public from radiation hazards. The California Department of Health Services Radiologic Health Branch administers the California Radiation Control Law, which governs the storage, use, transportation, and disposal of sources of ionizing radiation (radioactive material and radiation-producing equipment). Radioactive materials regulations require registration of sources of ionizing radiation, licensing of radioactive material, and protection against radiation exposure./10/ The Radiologic Health Branch also regulates the transportation of radioactive materials and disposal of radioactive waste. Radioactive materials users must maintain detailed records relating to the receipt, storage, transfer, and disposal of such materials. The regulations specify appropriate use and disposal methods for radioactive substances, as well as worker safety precautions and worker health monitoring programs.

Biological Safety

The San Francisco Hazardous Materials Permit and Disclosure Ordinance tracks infectious agents handled by businesses. As discussed above, the California Division of Occupational Safety and Health has adopted the Occupational Exposure to Bloodborne Pathogens Standard. Additional laws and regulations apply to animal use and medical waste management.

The U.S. Food and Drug Administration requires animal testing of drugs intended for human use. The Animal Welfare Act, administered by the Department of Agriculture, applies to the transportation, purchase, sale, housing, care, handling, and treatment of animals by carriers or by persons or organizations engaged in using animals for research or experimental purposes. The law exempts mice and rats from regulation. Federal and state laws require research facilities to keep records of all acquisitions, including births, sales, disposals, deaths, and transportation of animals. In addition, annual reports that include the location of the facility and the names and numbers of animals that did or did not experience pain and distress must be filed. Organizations must also register with the U.S. Department of Agriculture and establish an Institutional Animal Care and Use Committee.

In San Francisco, the California Department of Health Services delegates the responsibility of enforcing the California Medical Waste Management Act to the San Francisco Department of Public Health. The law applies to the generation, transportation, treatment, storage, and disposal of medical waste, and imposes a “cradle-to-grave” tracking system for off-site treatment, and a calibration and monitoring system for on-site treatment. Facilities that treat medical wastes must obtain a permit and are subject to annual audits. Medical waste is to be transported in closed red bags marked “biohazard” and placed inside hard-walled containers with lids.

STANDARD INDUSTRY PRACTICES

The handling and use of biohazardous materials are not regulated in a manner similar to the handling and use of hazardous chemical materials and radioactive materials. The National Research Council and the U.S. Department of Health and Human Services Public Health Service, National Institutes of Health, and Centers for Disease Control have established standards for working with biohazardous materials, including infectious agents, infected animals, and recombinant DNA, but in many instances, following these guidelines is not necessarily required by any state or federal laws. However, the standards of these agencies are normally respected as guidelines for those who handle biohazardous materials. Often, following these guidelines is indirectly required by laws and regulations that incorporate the guidelines by referring to them. For example, institutions conducting research funded by Department of Health and Human Services agencies must follow these guidelines.

According to U.S. Department of Health and Human Services guidelines described in *Biosafety in Microbiological and Biomedical Laboratories* and *Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines)*, four levels of containment practices are used to ensure biological health and safety. These levels are called biosafety levels. Biosafety Level 1 is for the least hazardous biological agents and Biosafety Level 4 is for the most hazardous biological agents. No Biosafety Level 4 operations are foreseeable as part of the project. Work with dangerous or exotic organisms occurs at only a few U.S. laboratories that specialize in such operations. Biosafety Level 3 operations at Commercial Industrial facilities are possible, but they would occupy a relatively small portion of the UCSF and Commercial Industrial space. UCSF has indicated that its activities in the Project Area would probably be limited to those requiring Biosafety Level 1 or Biosafety Level 2 containment.

For infectious agents, biosafety levels are based on 1) the characteristics of the agent (virulence, ability to cause disease, routes of exposure, biological stability, and communicability); 2) the quantity and concentration of the agent; 3) the procedures to be followed in the laboratory; and 4) the availability of therapeutic measures and vaccines. Biosafety Level 1 agents pose minimal or no

known potential hazard to individuals and the environment. Biosafety Level 2 agents are considered to be of ordinary potential hazard and may produce varying degrees of disease through accidental skin puncture wounds. However, Biosafety Level 2 agents may be effectively contained by ordinary laboratory techniques and specific laboratory equipment. Biosafety Level 3 agents pose more substantial risks; therefore, work with these agents must be conducted in contained facilities for which air flow is directed into the laboratory and access is controlled separately from public areas. Additional requirements apply to Biosafety Level 4 work, but these do not apply to the project.

Table H.4 summarizes the physical containment features that are appropriate for each biosafety level. Occupational and public safety are protected by selecting the appropriate biological containment and physical containment level for each biological material handled. For instance, manipulating a microorganism that is not normally known to cause disease requires the lowest level of physical containment, Biosafety Level 1.

For work with infectious agents and research animals, the practices, equipment, and facilities shown in Table H.5 apply. The principles behind animal biosafety levels are similar to those behind the basic biosafety levels presented in Table H.4. For more general animal research activities, the National Research Council has issued a *Guide for the Care and Use of Laboratory Animals*, which includes policies for monitoring the care and use of animals, their housing, their cleanliness, the structure and operation of the building housing the animals, and proper veterinary care. This handbook defines personnel qualifications and personal hygiene, and is designed to protect both animals and workers.

The National Institutes of Health Office of Recombinant DNA sets standards for work involving recombinant DNA molecules. These standards apply to worker safety, environmental control, contingency planning, and human clinical trials involving recombinant DNA techniques. These recombinant DNA guidelines incorporate safety precautions similar to the guidelines for handling infectious agents outlined in Tables H.4 and H.5.

HAZARD ASSESSMENT

This hazard assessment focuses on project-related businesses that would use relatively large quantities of hazardous materials. With the exception of UCSF, most of these businesses would occupy Commercial Industrial space. Detailed information about actual health and safety controls that would be implemented by specific businesses is unavailable because each business would likely develop its own strategy for complying with health and safety laws and regulations, and for implementing other appropriate safety programs. For this reason, this analysis assumes a variety of reasonably

TABLE H.4
SUMMARY OF RECOMMENDED BIOSAFETY LEVELS FOR WORK INVOLVING
INFECTIOUS AGENTS OR ORGANISMS THAT CONTAIN RECOMBINANT DNA

Containment Level	Agents	Practices	Safety Equipment (Primary Barriers)	Facilities (Secondary Barriers)
Biosafety Level 1	Agents not known to cause disease in healthy adults.	<p>Standard Microbiological Practices:</p> <ul style="list-style-type: none"> • Limit access; • Wash hands after handling materials or removing gloves and before leaving; • Do not eat, drink, smoke, handle contact lenses, or apply cosmetics; • Do not mouth pipette; • Minimize splashes and aerosols; • Decontaminate work surfaces; • Decontaminate wastes before disposal; • Control insects and rodents; • Wear gloves and labcoat. 	None required.	Open bench top sink required.
Biosafety Level 2	Agents associated with human disease. Routes of transmission may include cuts, ingestion, or mucous membrane exposure.	<p>Biosafety Level 1 plus:</p> <ul style="list-style-type: none"> • Limit access; • Post biohazard warning signs; • Take sharps precautions; • Implement any needed medical surveillance policies. • Dispose of medical waste properly. 	<ul style="list-style-type: none"> • Primary barriers: biosafety cabinets or other physical containment devices used for all manipulations that can cause splashes or aerosols of infectious materials. • Personal protective equipment: laboratory coats; gloves; face protection, as needed. 	<p>Biosafety Level 1 plus:</p> <ul style="list-style-type: none"> • Autoclave available.
Biosafety Level 3	Indigenous or exotic agents with the potential for aerosol transmission. Disease may have serious or lethal consequences.	<p>Biosafety Level 2 plus:</p> <ul style="list-style-type: none"> • Control access; • Decontaminate all wastes; • Decontaminate laboratory clothing before laundering; • Maintain baseline blood serum data. 	<ul style="list-style-type: none"> • Primary barriers: biosafety cabinets or other physical containment devices used for all manipulations of agents. • Personal protective equipment: protective laboratory clothing; gloves; respiratory protection, as needed. 	<p>Biosafety Level 2 plus:</p> <ul style="list-style-type: none"> • Physical separation from access corridors; • Self-closing, double door access; • Exhausted air not recirculated; • Directional airflow into laboratory.
Biosafety Level 4 (<i>not proposed at Mission Bay</i>)	Dangerous or exotic agents that pose a high risk of life-threatening disease or aerosol-transmitted laboratory infections; related agents with unknown risk of transmission.	<p>Biosafety Level 3 plus:</p> <ul style="list-style-type: none"> • Change clothing before entering; • Shower on exit; • Decontaminate all material that exits the facility. 	<ul style="list-style-type: none"> • Primary barriers: all procedures conducted in biosafety cabinets in combination with full-body, air-supplied, positive pressure personnel suit. 	<p>Biosafety Level 3 plus:</p> <ul style="list-style-type: none"> • Separate building or isolated zone; • Dedicated supply, exhaust, vacuum, and decontamination systems; • Various other requirements.

Source: U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, 3rd Edition, HHS Publication No. (CDC) 93-8395, May 1993.

TABLE H.5
SUMMARY OF BIOSAFETY LEVELS FOR ACTIVITIES IN WHICH
SMALL INFECTED ANIMALS ARE USED

Containment Level	Agents	Practices	Safety Equipment (Primary Barriers)	Facilities (Secondary Barriers)
Animal Biosafety Level 1	Agents not known to cause disease in healthy human adults.	<p>Standard Practices:</p> <ul style="list-style-type: none"> • Limit facility access; • Wash hands after handling animals or removing gloves and before leaving; • Do not eat, drink, smoke, handle contact lenses, or apply cosmetics; • Minimize aerosols; • Decontaminate work surfaces; • Keep inward opening, self-closing doors closed; • Decontaminate wastes; • Implement an insect and rodent control program; • Wear gloves and labcoat. 	As required for normal care of each species.	<ul style="list-style-type: none"> • Standard animal facility. • No recirculation of exhaust air; • Directional air flow recommended.
Animal Biosafety Level 2	Agents associated with human disease. Routes of transmission may include cuts, ingestion, or mucous membrane exposure.	<p>Animal Biosafety Level 1 plus:</p> <ul style="list-style-type: none"> • Limit access to animal rooms; • Post biohazard warning signs; • Take sharps precautions; • Prepare a biosafety manual; • Decontaminate all infectious wastes and animal cages prior to washing. 	<p>Animal Biosafety Level 1 plus:</p> <ul style="list-style-type: none"> • Primary barriers: containment equipment appropriate for animal species; • Personal protective equipment: laboratory coats, gloves, face and respiratory protection as needed. 	<p>Animal Biosafety Level 1 plus:</p> <ul style="list-style-type: none"> • Autoclave available; • Handwashing sink in animal rooms.
Animal Biosafety Level 3	Indigenous or exotic agents with potential for aerosol transmission. Disease may have serious health effects.	<p>Animal Biosafety Level 2 plus:</p> <ul style="list-style-type: none"> • Control access; • Decontaminate clothing before laundering; • Decontaminate cages before removing bedding; • Use disinfectant foot bath, as needed. 	<p>Animal Biosafety Level 2 plus:</p> <ul style="list-style-type: none"> • Primary barriers: containment equipment for housing animals and cage dumping activities; biosafety cabinets available for manipulative procedures (inoculation, necropsy) that may create infectious aerosols. • Personal protective equipment: respiratory protection. 	<p>Animal Biosafety Level 2 plus:</p> <ul style="list-style-type: none"> • Physical separation from access corridors; • Self-closing, double door access; • Sealed penetrations; • Sealed windows; • Autoclave in facility.
Animal Biosafety Level 4 (not proposed at Mission Bay)	Dangerous or exotic agents that pose a high risk of life threatening disease or aerosol transmission; related agents with unknown risk of transmission.	<p>Animal Biosafety Level 3 plus:</p> <ul style="list-style-type: none"> • Enter through change room where personal clothing is removed and laboratory clothing is put on; • Shower on exiting; • Decontaminate all wastes before removing from facility. 	<p>Animal Biosafety Level 3 plus:</p> <ul style="list-style-type: none"> • Primary barriers: maximum containment equipment (i.e., biosafety cabinet in combination with full body, air-supplied, positive-pressure personnel suit) used for all procedures and activities. 	<p>Animal Biosafety Level 3 plus:</p> <ul style="list-style-type: none"> • Separate building or isolated zone; • Dedicated supply, exhaust, vacuum, and decontamination systems; Other requirements.

Source: U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, 3rd Edition, HHS Publication No. (CDC) 93-8395, May 1993.

foreseeable practices that are common at similar developments. Some of these are specifically required by law, while others are simply common practice. The intent of this discussion is to demonstrate the extent to which complying with applicable laws and regulations, and implementing common practices that typically result from regulatory compliance, ensures a healthy and safe environment for workers, the public, and the environment.

The premise of this assessment is that, for health and safety effects to occur through project operations, exposure to a hazardous material must occur; therefore, this analysis examines the foreseeable effectiveness of the controls typically placed on potential pathways of hazardous materials exposure. Worker (local) exposure is considered first, followed by possible exposure of the larger community or the off-site environment (both within and outside the Project Area).

Worker (Local) Exposure

The effects of hazardous materials use are generally limited to the immediate areas where the materials are located. For this reason, the individuals most at risk due to the project would be the occupants of areas where hazardous materials are handled or stored. An individual can be exposed to a hazardous material through four pathways: 1) inhalation (breathing the substance), 2) ingestion (swallowing it), 3) direct contact with skin or eyes, or 4) injection (a skin puncture or cut). These pathways are addressed below for routine operations and upset conditions.

Routine Operations

Chemicals

Health effects of exposure to hazardous chemicals may be acute or chronic and vary considerably depending on each specific chemical. Acute effects, usually resulting from a single exposure, may include burns or other injuries to body organs or systems. Chronic effects, usually resulting from repeated or long-term exposure to a toxic material, could also include systemic or organ damage. Chronic toxic effects can also include birth defects and cancer.

To minimize exposure to chemicals in air, standard precautions include working under fume hoods or other forms of ventilation when using chemicals likely to present exposure hazards. Requirements for fume hoods are provided in the Uniform Mechanical Code. Proper ventilation may be used to keep indoor air concentrations below the Permissible Exposure Levels set by the U.S. Occupational Safety and Health Administration. Standard practice is also to keep contaminant concentrations at levels

below the Threshold Limit Values established by the American Conference of Governmental Industrial Hygienists./11/

To prevent exposure through skin contact, standard precautions include donning appropriate protective clothing, such as aprons, coats, gloves, and safety glasses. Proper washing after handling chemicals is also a standard practice. To prevent the potential ingestion of chemicals, eating, drinking, and smoking are routinely prohibited near hazardous materials. Training is a part of hazardous materials permitting, injury and illness prevention, and hazard communication requirements. It serves to increase the safety awareness of workers. This heightened awareness reduces the risks of exposure to hazardous chemicals through inhalation, absorption, ingestion, and injection.

Radioactive Materials

Radiation poses a health risk to those who are exposed, but exposure can be prevented with proper protective equipment and procedures. The potential health effects range from minor burns and headaches to cancerous tumors. Radioactive materials users must operate under licenses issued by the California Department of Health Services Radiologic Health Branch. Licensees must implement radiation safety programs designed to provide adequate protective measures against exposure to radiation sources. The Radiologic Health Branch routinely inspects radioactive materials licensees.

Like all hazardous materials, the effects of routine radioactive materials use are limited to areas where exposure may occur. These areas are located in the immediate vicinity of the radioactive materials themselves because the effects of radiation decrease rapidly with distance. For this reason, the individuals most at risk from radioactive materials use would be the occupants of the buildings, and more specifically the rooms, where radioactive materials would be handled. In addition to standard practices of good hygiene, exposure to radioactive materials is substantially controlled by shields made of materials that absorb radiation, such as lead and plexiglas. Radioactive materials that evaporate easily (e.g., radioactive iodine) are to be handled in fume hoods that draw the material away from the air a worker breathes.

The types of radioactive materials use foreseeable under the proposed project are similar to existing radioactive materials used at UCSF. According to UCSF, the natural background radiation levels in the San Francisco area are approximately 75 to 100 millirems (mrem) per year. The California Department of Health Services Radiologic Health Branch requires businesses to monitor worker exposure to radioactive materials in the workplace. Businesses use dosimetry badges and thyroid scans to monitor exposure. The doses to workers at UCSF facilities conducting biomedical research are estimated to be 0 to 20 mrem per year, a level similar to that of background radiation and below

applicable standards./12/ Similarly, routine project-related radiation exposure would likely be below applicable standards.

Biohazardous Materials and Animals

Recombinant DNA organisms, infectious agents, and other biological agents are sometimes used in research laboratories. Hazardous organisms used in biotechnology and life science research have the potential to cause illness in those exposed. The type of potential illness depends on the type and amount of biohazardous material to which a person is exposed. Exposure to human pathogens can also occur in medical clinics. Most biological materials handled within a laboratory setting pose little hazard to workers due to their lack of viability in the environment; others pose more substantial hazards. Implementing Universal Precautions as defined in the Occupational Exposure to Bloodborne Pathogens Standards serves to protect workers from routine exposure in clinical settings.

To minimize worker exposure to biohazardous materials, standard guidelines suggest the establishment of a biosafety program, as is common practice. A biosafety committee is typically named to implement the program. To prevent exposure by skin contact, laboratory coats and gloves are normally worn when working with biohazardous materials. Policies banning eating in laboratories and requiring workers to wash properly after handling biohazardous materials decrease the potential for ingestion of biohazardous materials. Exposure to infectious aerosols (suspended droplets) is considered to be the most common source of reported worker infections./13/ Biohazardous aerosols are generated during the mixing and shaking of hazardous organisms. The potential for hazards is decreased when biohazardous materials are handled in biosafety cabinets, as is standard practice. Routine injection would not occur. See "Upset Conditions" below.

The use of animals in research laboratories also poses potential hazards to workers. The most typical injuries experienced by animal workers are bites and scratches. Bites or scratches could lead to illnesses if the offending animal were infected with an agent capable of causing a human disease. Illnesses could also conceivably be contracted through other routes, such as physical contact, inhalation, or disease-carrying organisms. Infections could also result from research with infectious agents or diseases that are endemic to the animal being handled. As mentioned before, the types of possible health effects depend on which particular infectious agents are involved.

Policies that require the use of protective wear, safe experimental procedures, and safe animal handling decrease the chance of disease transmittal and other work-related hazards. Workers who handle animals typically follow the National Research Council *Guide for the Care and Use of Laboratory Animals*./14/ Additionally, the National Institutes of Health guidelines set forth in

Biosafety in Microbiological and Biomedical Laboratories and Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines) define appropriate safety precautions for work involving animals.^{/15/} Appropriate training and the use of protective equipment (such as laboratory coats and gloves) can prepare workers for the physical hazards of animal handling. Various controls (summarized in Table H.5) also limit the likelihood of contracting a disease from an animal. Operational controls routinely include limiting access, posting warning signs, and training employees in appropriate procedures.

Because implementing health and safety guidelines pertaining to biohazardous materials and animals is not required by law under all circumstances, this issue is discussed in “Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts.

Upset Conditions

Chemicals and Radioactive Materials

Accidents are probable at the proposed laboratories and other industrial uses during the life of the project. Accidents during hazardous materials use would be more likely to occur than during hazardous materials storage. Although some relatively large quantities of hazardous materials could be stored at individual locations, most workers would handle relatively small volumes of hazardous materials at any one time. This would minimize potential accident consequences.

Emergency response planning is a critical component of many health and safety laws and regulations, including requirements for Injury and Illness Prevention Plans, Hazard Communication Plans, Chemical Hygiene Plans, and hazardous materials registration under the Hazardous Materials Permit and Disclosure Ordinance. Standard safety practices would also minimize the consequences of potential accidents. For example, employees who work around hazardous materials typically wear protective equipment to minimize hazards in the event of an accident. Protective equipment worn when handling hazardous substances may include lab coats, safety glasses, and gloves. Emergency safety equipment typically includes eyewashes, safety showers, fire extinguishers, spill kits, and other equipment. Requirements specified in the San Francisco Municipal Code (Fire and Building Codes) require building designs to reflect safety considerations.

If an on-site accident were to warrant off-site assistance, the San Francisco Fire Department would respond. It maintains a Hazardous Materials Emergency Response Team to stabilize and clean up

after major hazardous materials incidents. Under optimal conditions, this special team can respond within 15 minutes of being called.

Biohazardous Materials and Animals

Worker exposure to biohazardous materials would be most likely to occur through accidental inhalation, cuts, ingestion, or absorption. Accidental exposure could cause an injury, illness, or fatality. Such exposure could occur if the Standard Microbiological Practices recommended in *Biosafety in Microbiological and Biomedical Laboratories* were not carefully applied, leading to incidents such as needle sticks, splashes, or animal bites. Accidents could happen as a result of the project, but most accidents would not result in exposure to biohazardous materials. For example, needle sticks occur occasionally in laboratories, but needle sticks do not necessarily result in exposure to biological materials. Many laboratories use only low-hazard biological materials, and Biosafety Level 1 materials are not known to cause disease in healthy adults.

Although the consequences of an accidental exposure could potentially be severe, the probability of serious illness or fatality as a result of project-related activities is believed to be low. The probability of relatively benign incidents (those that do not result in an illness) would be much higher. Using standard practices, equipment, and facilities when handling biohazardous materials (see Tables H.4 and H.5) would minimize both the probability of accidents occurring and the consequences of such accidents if they were to occur. The need for enforceable biohazardous materials management guidelines for the Project Area is discussed in “Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts.

Summary for Worker (Local) Exposure

Standard industry practices would likely protect workers from serious injuries or illness due to hazardous materials exposure through inhalation, ingestion, skin or eye contact, or injection. These standards include those issued by the National Research Council and the U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control, and National Institutes of Health, which are not otherwise required by law in some circumstances.

A study of workers compensation claims at UCSF showed that the number of injuries and illnesses experienced by workers in laboratory and allied occupations was not substantially different from the number experienced by all employees. The most common injuries involved lacerations and punctures (18%), contusions and bruises (19%), and sprains and strains (32%).^{16/} For this reason, the

potential for work-related health and safety hazards at the project site would not be expected to differ substantially from health and safety hazards at most other locations in San Francisco, assuming that the same laws and regulations are enforced, the level of compliance is substantial, and common industry practices are implemented. Issues related to the reliable implementation of these standard practices are discussed in “Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts. Similarly, the availability of appropriate hazardous materials emergency response services is discussed in “Emergency Response Capabilities” under “Other Issues” in Section V.I, Health and Safety: Impacts.

Larger Community Exposure (Off-Site Environment Within and Outside the Project Area)

The possible routes whereby project-related hazardous materials could expose off-site or public areas would be limited to 1) air emissions; 2) transport to, from, and around the site; 3) waste disposal; and 4) human contact. The potential for routine exposure through these routes is discussed briefly below, followed by an evaluation of the potential effects of accidents.

Routine Operations

Air Emissions

Toxic air contaminants would be emitted routinely from some foreseeable businesses and laboratory buildings. These emissions would be primarily chemical in nature, and the health effects of chemical emissions are addressed in “Potential Toxic Air Contaminant Emissions From the Proposed Project” under “Toxic Air Contaminants” in Section V.F, Air Quality: Impacts. Regarding possible routine radioactive emissions, studies conducted by UCSF conclude that the contribution of radioactive materials to the overall health risk of toxic air contaminants from biomedical and clinical health science laboratories is negligibly small/17/, and no other routine use of radioactive materials is foreseeable. Routine emissions of infectious agents would be controlled, when necessary, by handling these materials in biosafety cabinets that filter the infectious agents from the air. However, U.S. Department of Health and Human Services guidelines allow for substantial discretion regarding when potentially contaminated air must be filtered prior to discharge to the outdoors. The potential for project occupants to handle certain infectious agents (some of those requiring Biosafety Level 3 containment) without filtering air released to the outdoors is discussed in “Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts.

Transportation

Hazardous materials transportation requirements (e.g., packaging) ensure that no hazardous materials are routinely released during transit. Releases during transit would be accidents, as discussed below.

Waste Disposal

Businesses that would generate relatively large volumes of hazardous waste would be subject to regulatory oversight. The environmental effects of routine hazardous waste disposal through approved means are discussed in “Larger Waste Generators” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts.

Human Contact

Workers handling hazardous materials would typically follow standard industrial hygiene practices to prevent routinely exposing the individuals (off-site or in public places) to hazardous materials through human contact. These standard practices would include wearing protective clothing, washing after handling hazardous materials, avoiding splashes, cleaning work areas, and leaving protective clothing at work. If exposure were to occur, it would be an accident, as discussed under “Upset Conditions.”

Upset Conditions

Air Emissions

The health effects of chemical emissions are addressed under “Potential Toxic Air Contaminant Emissions From the Proposed Project” under “Toxic Air Contaminants” in Section V.F, Air Quality: Impacts. While most chemical emissions would be routine in nature, occasional accidents could contribute to overall emissions. Federal and state requirements for Risk Management Plans require users of the most hazardous types of materials (those that pose the greatest off-site risks) to study the potential risks posed by their operations and to implement measures to minimize these risks. The risks posed by potential accidents involving hazardous materials cannot be completely eliminated. Because the potential for accidents involving hazardous materials is believed to be of substantial public concern, the issue is discussed further and in more detail in “Risk of Upset” under “Potential Environmental Impacts of Hazardous Materials and Waste Management” in Section V.I, Health and Safety: Impacts.

As noted previously, radioactive materials can pose health hazards to those exposed. Under foreseeable circumstances, project-related radioactive materials use would be limited to relatively small quantities at any particular time and location. Therefore, an accidental release would involve relatively little radioactive material and be of short duration, thereby minimizing the possible exposure of off-site individuals to accidentally released radioactive materials.

Work involving biohazardous aerosols is typically performed in a biosafety cabinet, which filters air inside the cabinet and recirculates it. If a biosafety cabinet were to fail, aerosol suspensions of infectious agents could be released to the room, not outdoors. Work would generally cease (along with the activity generating the aerosols), and the aerosols would settle. Installing air filters in areas where infectious agents pose potentially serious health consequences may be necessary as discussed in "Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals" under "Potential Environmental Impacts of Hazardous Materials and Waste Management" in Section V.I, Health and Safety.

Transportation

Hazardous materials would be transported to, from, and through the Project Area in motor vehicles. The longest distance across the Project Area is less than 1 mile. California Department of Transportation (Caltrans) accident rate data (discussed below) indicate that motor vehicle accidents involving hazardous materials and waste are infrequent events, and packaging requirements limit the potential consequences of these possible accidents.

The probability of an accident during transport can be evaluated by reviewing Caltrans data. On state highways, Caltrans has found that about 3.69 vehicle accidents occur per million miles traveled (assuming urban streets with four or more undivided lanes).^{18/} These data apply to all types of vehicles and do not distinguish between accidents that involve hazardous materials and those that do not. Vehicles carrying hazardous materials (in addition to the fuel and other hazardous materials required to operate a vehicle) in the project vicinity would be expected to experience similar accident probabilities. However, only a fraction of the accidents involving vehicles carrying hazardous materials actually affect the integrity of the hazardous materials containers on board. To minimize the potential for accidental spills of hazardous materials during transit, suppliers and transporters are required to follow U.S. Department of Transportation and U.S. Postal Service regulations for packaging and handling. While these containment requirements are not as stringent as those for hazardous waste (discussed below), they would reduce the possibility of a release in the project area. Radioactive materials are shipped inside shielded containers. The required packaging for infectious agents is designed to withstand the rigors of travel. Special vendors deliver items such as cylinders

containing compressed gases. Animals are transported in specially designed boxes. As a result of packaging requirements, few accidents involving vehicles carrying hazardous materials involve a release of those materials.

To minimize the potential for accidental spills of hazardous waste during vehicle transit (as opposed to hazardous materials in transit as discussed above), suppliers and transporters are required to follow U.S. Department of Transportation and California Department of Toxic Substances Control regulations for packaging and handling hazardous waste. Prior to off-site shipment by licensed hazardous waste haulers, wastes are to be packed in drums and containers that meet U.S. Department of Transportation requirements. Biohazardous waste must be placed in easy-to-recognize red bags, and sharps must be kept in hard-walled containers with lids. Most biohazardous waste sent off site for disposal would be solid; therefore, biohazardous waste would disperse little if released and would be relatively easy to clean up. Because of these strict requirements, containers are unlikely to release their contents in the event of an accident, and the consequences of a vehicle accident involving hazardous waste in the Project Area would be minimal.

Waste Disposal

Under certain circumstances, radioactive and treated biohazardous materials may be disposed of down drains if approved and overseen by the California Department of Health Services Radiologic Health Branch or Medical Waste Program, and the San Francisco Department of Public Health. Pouring hazardous chemicals down drains without a permit, or in excess of quantities allowed under permit, is prohibited by law. Similarly, disposing of hazardous materials with ordinary solid waste is prohibited by law. Invariably, some hazardous waste does get discharged to the sewer or placed with non-hazardous solid waste. Since inappropriate disposal practices should not be routine operating conditions for most businesses, such disposal is discussed here as “accidents.”

Sewers

Because the project-related businesses that would store relatively large volumes of hazardous materials would typically handle relatively small volumes at any one time, the types of sewer discharge violations that could occur would, in most instances, be too small to have any noticeable physical effect on the wastewater treatment plant. Water from the Project Area would also be diluted by other San Francisco wastewater discharges. The issue of potential discharges from Commercial Industrial areas is discussed further under “Quality of Municipal Wastewater from the Project” in Section V.K, Hydrology and Water Quality: Impacts.

Solid Waste

The City and County of San Francisco and Norcal Waste Systems (the City's solid waste contractor) jointly implement a Waste Acceptance Control Program to prevent hazardous waste from posing a health risk to garbage collectors or going to the solid waste landfill. The program has both education and inspection components. Sanitary Fill, Sunset Scavenger, and Golden Gate Disposal Companies (subsidiaries of Norcal Waste Systems) notify customers about the kinds of waste that are prohibited (e.g., hazardous and infectious waste). Signs posted on collection company containers inform the public regarding California hazardous waste regulations. All garbage collectors are trained to identify hazardous waste. If hazardous waste is detected, the collector removes it or refuses to service the container, and informs the route supervisor. Customers are provided with recommendations and referrals for proper disposal.

Solid waste is also subject to visual inspection at San Francisco's solid waste transfer station at Tunnel and Beatty Avenues. On average, program compliance staff perform a complete inspection of at least five loads per week chosen at random. Customers or collection drivers are instructed to unload the waste for inspection before tipping the load into the transfer station pit. Prohibited waste is returned to the generator, if possible./19/

Human Contact

To prevent off-site exposure of the public and environment (both within and outside the Project Area) through direct or indirect contact, workers who handle hazardous chemicals and radioactive materials use standard hygiene practices as discussed above for routine operation. The potential is remote for accidental exposure of the public to chemical hazards sufficient to pose serious threats. The effect of any chemicals posing serious acute hazards would likely be noticed by workers before transferring enough of the material to cause trouble by direct or indirect human contact.

Cases of public exposure to infectious agents through human contact have been sporadic and infrequent. Laboratories where workers handle infectious agents have not been shown to pose a public health threat to the community./20/ Standard Microbiological Practices used to control exposure to infectious agents (described in Tables H.4 and H.5) include washing hands before leaving the facility and leaving protective equipment at work. These practices minimize the likelihood of accidental disease transmission to the public or other individuals off site. Because the likelihood of a serious accident would be low, the risk posed by such accidents would also be low.

The public (or wild or domestic neighborhood animals) is unlikely to be accidentally exposed to illnesses carried by animals because the animals would be unable to escape from their cages and through laboratory doors. Likewise, the public would not be physically injured (bitten or scratched) by animals because the animals would be caged and access to research animals would be controlled. Because of the multiple layers of control specified in applicable animal care and use guidelines, the potential for a serious accident involving research animals would be remote.

Summary for Larger Community Exposure (Off-Site Environment Within and Outside the Project Area)

Standard industry practices would likely protect the off-site community and environment from many types of serious injuries or illness due to routine hazardous materials exposure. However, air contaminated by some infectious agents requiring Biosafety Level 3 containment could pose public hazards if the laboratory exhaust is improperly filtered. Similarly, certain hazardous chemicals could pose substantial safety risks to the neighbors of proposed businesses if accidentally released. These issues are discussed in "Enforcement of Guidelines for Work Involving Biohazardous Materials and Animals" under "Potential Environmental Impacts of Hazardous Materials and Waste Management" in Section V.I, Health and Safety: Impacts. Likewise, the potential for accidents involving hazardous materials is further explored in "Risk of Upset" under "Potential Environmental Impacts of Hazardous Materials and Waste Management" in Section V.I, Health and Safety: Impacts.

NOTES: Appendix H, Health and Safety

1. California Health and Safety Code, Section 25501.
2. California Health and Safety Code, Section 25117, and California Code of Regulations, Title 22, Section 66261.2.
3. Code of Federal Regulations, Title 40, Section 261.2 (a)(2).
4. City and County of San Francisco, Planning Department, *Mission Bay Final Environmental Impact Report*, Planning Department File No. 86.505E, State Clearinghouse No. 86070113, August 23, 1990, Volume Two, pp. VI.N.21-VI.N.26.
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6. California Health and Safety Code, Section 25022.5, and Code of Federal Regulations, Title 40, Section 259.10.
7. a) U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, Third Edition, May 1993.

- b) U.S. Department of Health and Human Services National Institutes of Health, *Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines)*, January 1996.
8. California Health and Safety Code, Section 25033.2.
9. California Health and Safety Code, Section 25531.
10. California Code of Regulations, Title 17.
11. American Conference of Governmental Industrial Hygienists, *1997 TLVs® and BEIs®*, 1997.
12. University of California San Francisco, *Revised Laurel Heights Plan; Center for Social, Behavioral and Policy Sciences, and Campus Administration Environmental Impact Report*, State Clearinghouse No. 95033072, September 6, 1995.
13. U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, Third Edition, May 1993.
14. National Research Council, *Guide for the Care and Use of Laboratory Animals*, 1996.
15. a) U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, Third Edition, May 1993.
- b) U.S. Department of Health and Human Services National Institutes of Health, *Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines)*, January 1996.
16. University of California San Francisco, *Revised Laurel Heights Plan; Center for Social, Behavioral and Policy Sciences, and Campus Administration Environmental Impact Report*, State Clearinghouse No. 95033072, September 6, 1995.
17. a) Radian Corporation, *Assessment of Environmental Impacts for the University of California San Francisco, Phase III, Health Risk Assessment*, August 31, 1989.
- b) ENSR Consulting and Engineering, *Risk Assessment of the UC San Francisco-Mount Zion Hospital and Medical Center*, September 1989.
18. California Department of Transportation, *1996 Accident Data on California State Highways (Road Miles, Travel, Accident Rates)*, 1997.
19. Environmental Science Association, *Sanitary Fill Company Recycling and Solid Waste Systems Plan Draft Environmental Impact Report*, State Clearinghouse No. 90030932, February 24, 1995 (prepared for the City and County of San Francisco, which has neither completed nor certified this environmental impact report.)*
20. U.S. Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*, Third Edition, May 1993.

* A copy of this report is on file for public review at the Office of Environmental Review, Planning Department, 1660 Mission Street, San Francisco.

I. CONTAMINATED SOILS AND GROUNDWATER

This appendix summarizes the investigation and methods used to evaluate the results presented in *Results of Investigation, Mission Bay North of Channel* (“1997 Mission Bay North report”) and *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel* (“1998 Mission Bay South report”), prepared by ENVIRON International Corporation (ENVIRON). This section also summarizes additional methods used to evaluate existing conditions in the Project Area, as presented in *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, and *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, prepared by ENVIRON.

The section “Field Investigation and Sample Analysis Procedures” provides more details on methodologies ENVIRON used to sample soils and groundwater in Mission Bay North and Mission Bay South in preparing the Site Investigation Reports for the two parts of the Project Area. Reports and agency correspondence that were used to develop the scope of the field program are listed in Table I.1. Tables I.2 and I.3 summarize historic land uses and locations of underground storage tanks (USTs), respectively.

“Summary of Soil and Groundwater Sampling Results” summarizes the results of soil and groundwater testing, as presented in the 1997 Mission Bay North and 1998 Mission Bay South reports. Tables I.4 through I.15 list the chemical detected, the number of samples in which the chemical was detected, the number of detections of each chemical compared to the total number of samples analyzed for that particular chemical (frequency of detection), and the range of concentrations.

A discussion of the methods that were used to evaluate potential human and ecological effects under existing conditions is summarized in “Methodology for Evaluating Existing Human Health and Ecological Risks Due to Contaminants Detected in Soil and Groundwater in the Project Area Prior to Construction.” This subsection also includes a discussion of methods used in the tidal influence study to determine the extent to which the concentrations of chemicals in groundwater are reduced as groundwater adjacent to China Basin Channel and San Francisco Bay moves toward the tidally-influenced surface water bodies that border the Project Area.

Methods that were used to evaluate potential human health risks that could result from exposure to dust generated during construction activities, absent control measures, are presented in “Methodology to Evaluate Human Health Risk Due to Exposure to Uncontrolled Construction-Generated Dust.” The purpose of the analysis was to identify worst-case risks that could occur if no dust controls were

TABLE I.1
SOIL AND GROUNDWATER INVESTIGATIONS AND PROJECTS COMPLETED SINCE 1990
IN THE MISSION BAY PROJECT AREA /a/

Date	Investigation Site (and report preparer)
March 1990	Underground Tank Removal, Santa Fe Realty Corporation, 1420 Fourth Street, San Francisco, California (Levine-Fricke)
August 1990	Mission Bay Hazards Mitigation Program (Environmental Science Associates)
September 1990	Esprit de Corp Phase II Site Investigation, 499 Illinois Street, San Francisco, California (ENSR Consulting and Engineering)
October 1992	Remedial Activities and Tank Removal Report, 195 Channel Street, San Francisco, California (Levine-Fricke)
April 1993	Report on Underground Tank Removal, 300 16th Street, San Francisco, California (Baseline Environmental Consulting)
July 1993	Report, Site Investigation, I-280, EA #280031, San Francisco, California (APEX)
August 1993	Report and Work Plan, Underground Tank Removal, 300 16th Street, San Francisco, California (Baseline Environmental Consulting)
October 1993	Proposed Area Wide Survey Plan, Mission Bay Project Area, San Francisco, California (Levine-Fricke)
July 1994	Underground Storage Tank Removal Report, 1355 6th Street, San Francisco, California (Levine-Fricke)
August 1994	Tank Removal Report and Investigation, 255 Channel Street, San Francisco, California (REACT Environmental Services Corporation)
May 1995	Summary of Chemical Data Collected at the Mission Bay Project Area (letter from Geomatrix Consultants to Catellus)
July 1995	Summary of Chemical Data Collected at the Mission Bay Project Area (letter from Geomatrix Consultants to Catellus)
January 1996	Soil Stockpile Completion Report, Mission Bay Project Area, San Francisco, California (Geomatrix)
June 1996	Request for Risk Management Plans for Six Former Underground Storage Tank Sites, Mission Bay, San Francisco, California (letter from RWQCB to Catellus)
August 1996	Extension of Workplan for Preliminary Survey at Mission Bay North of Channel (letter from RWQCB to Catellus)
October 1996	Risk Management Plans for Six Former Underground Storage Tank Sites at the Mission Bay Site, San Francisco, California (ENVIRON)
October 1996	Work Plan for Preliminary Survey, Mission Bay North of Channel, San Francisco (ENVIRON)

(Continued)

TABLE I.1 (Continued)

Date	Investigation Site (and report preparer)
November 1996	Approval of Workplan for Preliminary Survey at Mission Bay North of Channel (letter from RWQCB to Catellus)
February 1997	Underground Tank Site: Sixth and Berry, Mission Bay, San Francisco, California (letter from RWQCB to Catellus)
February 1997	Underground Tank Site: 1420 Fourth Street, Mission Bay, San Francisco, California (letter from RWQCB to Catellus)
March 1997	Report of Findings, Phase II Environmental Site Assessment, Former ATSF China Basin Railyard, San Francisco, California (ERM-West)
April 1997	Results of Site Investigation, Mission Bay North of Channel, San Francisco, California (ENVIRON)
April 1997	Sampling Program for Subsurface Investigation, Mission Bay: Area South of China Basin Channel (letter from Catellus/ENVIRON to San Francisco Regional Water Quality Board)
June 1997	Mission Bay, North of Channel, San Francisco (letter from RWQCB to Catellus)
June 1997	Environmental Assessment of RMC Lonestar Property (letter from ENVIRON to Catellus)
August 1997	Tentative Site Cleanup Requirements (letter from RWQCB to ARCO, Chevron, Phillips Petroleum, and UNOCAL)
September 1997	Site Investigation and Cleanup of Fuel and Oil Storage Area and Supply and Distribution Pipelines (letter from RWQCB to ARCO, Chevron, Phillips Petroleum, Texaco, and UNOCAL)
November 1997	Proposed Project Schedule for Environmental Activities in the Vicinity of Pier 64, San Francisco, California (Pacific Environmental Group)
November 1997	Work Plan for Site Assessment in the Vicinity of Pier 64, San Francisco, California (Pacific Environmental Group)
January 1998	Request for Revised Work Plan and Project Schedule for Environmental Activities in the Vicinity of Pier 64 (letter from RWQCB to ARCO, Chevron, Phillips Petroleum, Texaco, and UNOCAL)
February 1998	Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California (ENVIRON)
February 1998	Response to Comments on Joint Assessment Work Plan, Former Petroleum Terminals and Associated Pipelines, Vicinity of Pier 64 (letter from Pacific Environmental Group to ARCO, Chevron, Phillips, UNOCAL, and Texaco).
April 1998	<i>Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area</i> (ENVIRON)

(Continued)

TABLE I.1 (Continued)

Date	Investigation Site (and report preparer)
April 1998	<i>Technical Memorandum #2, Development and Screening of Remedial Alternatives for Free Product Area in Region of Former Oil Storage Facilities, Mission Bay Project Area (ENVIRON)</i>
April 1998	<i>Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area (ENVIRON)</i>

Notes:

Document preparer shown in parentheses.

- a. List includes documents used to develop the work plans, sampling programs, evaluate results, and support conclusions presented in the 1997 Mission Bay North and Mission Bay South reports.

Source: ENVIRON International Corporation, 1997 Mission Bay North Report and 1998 Mission Bay South Report; EIP Associates, 1998.

implemented so that appropriate dust control measures could be developed for the Risk Management Plan (RMP) for the Project Area.

The section "Post-Development Risk Evaluation Methodology" describes the approach used to develop site-specific target levels of various chemicals found in soil or groundwater for the risk evaluations prepared by ENVIRON to determine potential effects after project completion and during long-term occupancy and operation of the proposed project.

FIELD INVESTIGATION AND SAMPLE ANALYSIS PROCEDURES

Mission Bay North

Between December 5, 1996, and February 17, 1997, the Mission Bay North investigation was conducted in the Mission Bay area of San Francisco, California. The work was conducted by ENVIRON on behalf of Catellus Development Corporation (Catellus). The investigation included the collection of 28 soil samples from 14 borings; the installation, development, and sampling of 14 groundwater monitoring wells; a tidal influence study; and the decommissioning of seven temporary wells. All work was conducted under the supervision of a California registered geologist. The procedures used during each of the above tasks are discussed below.

TABLE I.2
HISTORICAL SITE USAGE BY PARCEL

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
<i>Mission Bay North</i>			
3795-2	Ice company; hotel; meat packing company; furniture manufacturer; lumber company; mill; cooperage; rail yards and associated freight sheds	Parking area	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, WTCs, pesticides, HVOCs, metals
3795-3	Glass works; railroad storage sheds and concourse	San Francisco Recreational Vehicle Park	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, metals
3795-4	Glass works; building material storage yard; boat building shop; general merchandise warehouse; railroad passenger terminal and concourse	San Francisco Recreational Vehicle Park	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, metals
3796-3	Antimony French Star; grain warehouse; coal oil and lubricating oils; lumber storage; railroad freight sheds, offices, and tracks	Vacant (roadway construction)	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, HVOCs, metals
3797-2	Wharf area; Standard Oil warehouse; Studebaker warehouse; agricultural warehouse; wine warehouse; lumber storage yard; railroad tracks and related sheds	Vacant (roadway construction)	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, HVOC, metals
3798-1	Railroad tracks	Railroad tracks, storage sheds	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, HVOCs, metals
3798-2	Railroad tracks and loading platforms; railroad repair shop	Railroad tracks; roadway demolition debris; small food stand	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, pesticides, HVOCs, metals

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/h/
3804-2,4	Lumber mill and yards; vinegar works; railroad tracks and rail car parking	Vacant (roadway construction) Fourth Street Pumping Station	Acid and alkaline solutions, PAHs PCBs, petroleum fuel, WTCs, metals
3804-5	Planing Mill; lumber yard; box factory; coal, oil, and lubricant warehouse; Antimony French Shop	Vacant (roadway construction)	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, WTCs, HVOCs metals
3805-1	Municipal dump; shipbuilding yard; brewing company depot; artificial stone company; planing mill; woodenware and cooperage company; brick company; lumber yards; agricultural company; concrete mixer, sand and gravel bunkers	Vacant (roadway construction)	Acid and alkaline solutions, PAHs, PCBs, petroleum fuel, WTCs, HVOCs, metals, asbestos
<i>Mission Bay South</i>			
3805-1 (partial)	Fill material (from municipal dump); ship building yard; brewing company depot; artificial stone company; planing mill; woodenware and cooperage company; brick company; warehouse; lumber yards; agricultural company; concrete mixer; sand and gravel bunkers; parking.	Vacant (roadway construction).	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals, asbestos.
3806-6 (partial)	Fill material (from municipal dump); ship building yard; brick company; brick yard; oil/gasoline storage; lumber yard; building supplies and storage yard.	Channel Pumping Station.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals, asbestos.
3806-7	Fill material (from municipal dump); oil company including oil tanks and chemical mixing tanks; box factory; lithographic company; lumber and brick yard; lumber mill; scrap metal yard (cars, trucks, oil tanks, barrels); soil spoil storage and dumping.	Vacant (roadway construction).	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3806-9	Fill material (from municipal dump); oil barrel storage; hay warehouse; buggy shed; brick company; lumber yards; railroad tracks.	Channel Pumping Station; railroad tracks.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, metals, asbestos.
3809-2	Fill material (from municipal dump); lumber company and yard; planing mill; garage; wrecking company.	Open space (with dumping of garbage); container storage.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3809-4	Fill material (from municipal dump); lumber company; planing mill; lumber yard; metal and lumber storage; wrecking company; junk yard; building materials storage.	Golf driving range.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3809-6	Fill material (from municipal dump); lumber yard.	Open space used for spoil storage from Channel Pumping Station.	Alkaline and acid solutions, PAHs, PCBs, pesticides, WTCs, metals.
3809-7	Fill material (from municipal dump); lumber yard; railroad tracks; barrel storage; open space used for trash dumping.	Railroad tracks; open space.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3810-6	Fill material (partially from municipal dump); lumber yard; lumber company; wharf area; railroad buildings; garbage docks.	Asphalt road (Channel Street); parking.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3810-7	Fill material (partially from municipal dump); lumber yards; pipe yard; hay yard; garbage dock; icing platform; boiler house; warehouses; metal salvage company; rail-related activities including rail yard, railroad car parking, incinerator, scales, carpenter shop, storehouse, blacksmith shop, electrical shop, dryer shed, and aboveground tanks; automobile maintenance and repair; dumping of soil spoils; trucking company; Hills Bros. coffee.	Trucking and storage facilities; import and trading companies; food service distribution facilities; construction products company; automobile, bus, and truck maintenance facilities; other miscellaneous businesses.	Alkaline and acid solutions, HVOCs (including paint solvents), PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals, asbestos.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3813-1	Fill material; lumber yard; grain storage; warehouses; rail-related activities (including warehouses, train sheds, and an oil storehouse); dumping; dolly rental; construction company; food distribution centers; drive-in eatery.	Roller hockey rink.	Alkaline and acid solutions, PAH, PCBs, pesticides, petroleum fuel, WTCs, metals.
3819-2	Fill material (from municipal dump); lumber yard; rock-grinding company; lumber sheds and storage yard; lumber mill; metal working and auto repair; interstate construction yard; auto wrecking company; police impoundment lot.	Golf driving range.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals, asbestos.
3819-3	Fill material (from municipal dump); brick yard; metal working and auto repair; rock-grinding company; barrel storage; some dumping.	Mainly open space; Dispatch Transportation Company.	Alkaline and acid solutions, metals, asbestos.
3822-2	Fill material (partially from municipal dump); metal sheds; baled hay and cotton warehouses; corral; lumber company and yard; police impoundment lot; vehicle storage and vehicle crushing; some dumping; old oil/gasoline tank storage.	Golf driving range.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3822-3	Fill material (partially from municipal dump); brick company; roofing company; lumber company; fuel company.	Dispatch Transportation Company and associated parking; railroad tracks; open space.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3832-2	Fill material; brick yard; lumber yard; boat junk yard; metal storage yard; warehouse; some dumping; police impoundment lot.	Kirk Paper Company (retail); Shane-Hunter, Inc. (linen retail).	Alkaline and acid solutions, HVOCs (including paint solvents), PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3832-3	Fill material; warehouses; lumber companies and yards; junk yard; dumping.	Dispatch Transportation Company and associated parking; railroad tracks; open space.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3835-2	Fill material; furniture company; boiler works; lumber yard; pavement company; oil tank storage; dumping.	Dispatch Transportation Company, Bay Area Super Shuttle (some maintenance), railroad tracks.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3835-3	Fill material; baled paper warehouse; baled cotton storage; box company; fuel and road oil company; scrap metals company; garages (with oil separators, sump pumps, wash racks, and barrel storage yard); paint company; junk yard; freight related buildings; parking lots; auto repair; dumping; towing company; ice cream company.	Downtown Auto Sales; Globe-Bay Area Forklift Company; Kirk Paper Company (retail); open space.	Alkaline and acid solutions, HVOCs (including paint solvents), PAHs, PCBs, pesticides, petroleum fuel, metals.
3837-1	Fill material; possible former wharf; rail-related activities including oil house, material platform, coal bin, car repair shed, and railroad tracks.	Railroad tracks.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals.
3837-4	Fill material; possible former wharf; lumber shed; fire house.	Soup kitchen; railroad tracks.	Petroleum fuel.
3838-1	Fill material; possible former wharf; oil storage facilities; offices; water tanks; glass container warehouses; barrel storage; freight warehouse; truck parking.	Warehouse; asphalt parking area.	Alkaline and acid solutions, petroleum fuel, metals.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3838-2	Fill material; possible former wharf; street; parking area; freight warehouse and associated truck parking.	Warehouse; asphalt parking area.	Acid solutions, petroleum fuel.
3838-3	Fill material; possible former wharf; streets; dumping; parking areas; railroad tracks.	Warehouse; asphalt parking area; railroad tracks.	Pesticides, petroleum fuel.
3839-1	Fill material; open space; freight-related company; parking.	Parking/truck loading area; railroad tracks.	Acid solutions, petroleum fuel.
3839-2	Fill material; open space; freight-related company; railroad tracks; service station for rail cars including oil sumps and aboveground fuel storage area.	Railroad tracks.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals.
3840-1	Fill material; grain warehouse; oil warehouse with possible aboveground storage tank; lumber or metal yard; freight shed; railroad tracks; parking.	Warehouse; parking/truck loading area.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3840-2	Fill material; former street; parking; open space.	Warehouse; parking/truck loading area.	Acid solutions, petroleum fuel.
3840-3	Fill material; former street; lumber or metal yard; miscellaneous storage; parking.	Warehouse.	Acid solutions, petroleum fuel, WTCs.
3841-1	Fill material; railroad car repair yard; oil company (including railroad tracks and two aboveground storage tanks); coal depot; chemical warehouse; sand and gravel cement mixing.	Bode Gravel.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals, asbestos.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3841-3	Fill material; railroad car repair yard (including three aboveground storage tanks); open space; junk yard; sand and gravel cement mixing.	Bode Gravel.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, metals, asbestos.
3849-1	Fill material; rail-related activities including storehouse, coach shop, machine shop, boiler house, and railroad tracks; oil company; open space subject to dumping and possible use as a junk yard; sand and gravel cement mixing.	Bode Gravel.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals, asbestos.
3849-2	Fill material; rail-related activities including storehouse, coach shop, machine shop, boiler house, and railroad tracks; oil company; open space subject to dumping and possible use as a junk yard; sand and gravel cement mixing.	Bode Gravel.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals, asbestos.
3850-1, 1A, 1B	Fill material; packing company; truck and freight-related activities; junk yard; automotive center warehouse; parking.	Auto body shop; parking.	Alkaline and acid solutions, petroleum fuel, metals.
3850-2	Fill material; street; open space; parking associated with trucking and freight activities.	Warehouse; auto body shop; parking.	Acid solutions, petroleum fuel.
3851-1	Fill material; warehouses; dumping; railroad tracks; truck parking.	Parking/truck loading area; railroad tracks.	Alkaline and acid solutions, PCBs, pesticides, petroleum fuel, metals.
3852-1	Fill material; warehouse; rail yard; parking.	Parking; railroad tracks.	Alkaline and acid solutions, pesticides, petroleum fuel.
3852-2	Fill material; lime and hydrate company; lumber company and yard; railroad tracks; parking area.	Parking; railroad tracks.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3853-1	Fill material; stock corral; open space; junk yard; sand and gravel cement mixing.	Bode Gravel.	Alkaline and acid solutions, metals.
3880-1 (partial)	Fill material; rail-related activities including engine house, railroad car parking, freight sheds, above ground oil storage tanks, oil sumps, and numerous tracks; dumping; truck-related activities including shipping and receiving, warehousing, and maintenance.	Portion of parcel within site boundaries: parking; storage; open space; railroad tracks.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals.
3892-1	Fill material; oil companies and related activities including crude oil storage, aboveground storage tanks, underground pipelines, offices, and railroad tracks; lumber company; trucking-related activities; junk yard; maintenance and repair facilities.	Franciscan Bus Lines; Cresco Equipment Rentals; storage yard.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3940-2	Fill material; planing mill; lumber storage; railroad tracks; parking.	Railroad tracks.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals.
3941-1	Fill material; lumber company; shipbuilding company; transportation company; aircraft warehouse; boat building; rice company; asbestos company; shipping and receiving companies.	Esprit Factory Outlet parking (northern portion of lot); Blue Peter Inc.; junk yard.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, WTCs, metals, asbestos.
3942-2	Fill material; railroad tracks; open space; oil company; distribution company; parking lot.	Figone Cold Storage.	Alkaline and acid solutions, HVOCs, PAHs, PCBs, pesticides, petroleum fuel, metals.
3942-3	Fill material; vacant land; cold storage plant; railroad tracks; parking.	Figone Cold Storage.	Alkaline and acid solutions, HVOCs, PCBs, pesticides, petroleum fuel, metals.

(Continued)

TABLE I.2 (Continued)

Parcel No./a/	Previous Use/b/	Current Use/c/	Potential Chemicals of Concern/b/
3942-4	Fill material; oil company including 8,000-barrel oil tank and oil stored in barrels; corral; warehouse; railroad tracks; mill company; well casing company including four medium aboveground storage tanks; ship building; glass works; cold storage company; some dumping; building materials and cement company.	RMC Lonestar Construction Material Supply.	Alkaline and acid solutions, pesticides, petroleum fuel, WTCs, metals, asbestos.
3943-6	Large crude tank and oil sump associated with nearby railroad roundhouse; some dumping; parking.	Parking/truck loading area.	Alkaline and acid solutions, PAHs, PCBs, pesticides, petroleum fuel, metals.
3944-4	Fill material; steam pipe and boiler covering manufacturer; railroad activities including roundhouse, machine shop, boiler room, oil storage, engine house, oil sumps, propane tanks, paint shops, and railroad tracks; electric supplier; warehouse; glass works; some dumping; parking lots.	City Electric Supply; equipment rental; warehouses/distribution company; office space; parking/truck loading areas.	Alkaline and acid solutions, HVOCs (including paint solvents), PAHs, PCBs, pesticides, petroleum fuel, metals.
3948-1	Fill material; roofing company; paint mill; brass foundry; railroad tracks.	Open space; railroad tracks.	Alkaline and acid solutions, HVOCs (including paint solvents), PAHs, PCBs, pesticides, petroleum fuel, metals.

Notes:

- a. See Figure I.1 for the locations of Assessor's Blocks and lots.
 - b. Information regarding historical site usage and potential chemicals of concern from *Mission Bay Hazards Mitigation Program* (ESA August 1990) and *Proposed Area Wide Survey Plan* (Levine-Fricke October 1993).
 - c. Information regarding current site usage from recent aerial photographs and ENVIRON observations during Mission Bay South field program.
- WTCs = Wood Treatment Compounds
 HVOCs = Halogenated Volatile Organic Compounds
 PAHs = Polycyclic Aromatic Hydrocarbons
 PCBs = Polychlorinated Biphenyls

Source: 1990 FEIR; ENVIRON International Corporation, 1997 Mission Bay North Report and 1998 Mission Bay South Report.

TABLE I.3
SUMMARY OF UNDERGROUND STORAGE TANKS IN PROJECT AREA

Map Location /a/	Status	Comments	References /b/
1	Removed	10,000-gallon gasoline tank removed 1988.	Levine-Fricke December 16, 1988a Levine-Fricke October 15, 1993 ENVIRON October 29, 1996 RWQCB February 20, 1997a
2	Removed		Levine-Fricke October 15, 1993
3	Existing		Levine-Fricke October 15, 1993
4,5	Removed	One 2,000-gallon and one 3,000-gallon gasoline and diesel tank removed 1988.	Levine-Fricke December 16, 1988b Levine-Fricke October 15, 1993 ENVIRON October 29, 1996
6,7	Removed	Two tanks installed in 1978: one 7,500-gallon gasoline tank and one 5,000-gallon diesel tank. Removed in 1994.	REACT August 30, 1994 Levine-Fricke October 15, 1993
8,9,10	Removed	Three tanks used for storage of diesel (10,000-gallon capacity), gasoline (10,000-gallon capacity), and waste oil (1,000-gallon capacity) removed in 1988.	Levine-Fricke December 16, 1988c Levine-Fricke October 15, 1993 ENVIRON October 29, 1996
11	Removed		Levine-Fricke October 15, 1993
12	Removed	One 500-gallon waste oil tank removed in 1992.	Levine-Fricke October 23, 1992 Levine-Fricke October 15, 1993 ENVIRON October 29, 1996

(Continued)

TABLE I.3 (Continued)

Map Location /a/	Status	Comments	References /b/
13	Removed		Geomatrix July 11, 1995
14, 15, 16	Removed	One 1,000-gallon gasoline tank (T-14), one 2,000-gallon gasoline tank (T-15), and 1,000-gallon diesel tank (T-16) removed in 1988.	Levine-Fricke December 16, 1988d Levine-Fricke October 15, 1993 ENVIRON October 29, 1996
17, 18, 19	Removed	One 500-gallon petroleum hydrocarbon tank (T-17) removed in 1994. One 5,000-gallon gasoline tank (T-18) and one 8,000-gallon diesel tank (T-19) removed in 1988.	Levine-Fricke December 16, 1988e Levine-Fricke July 25, 1994 Levine-Fricke October 15, 1993
20	Removed	1,000-gallon UST.	Levine-Fricke October 15, 1993
21	Unknown	Confirmed verbally; no records of tank based on recent ENVIRON environmental assessment of property.	Verbal communication from current tenant.
22	Removed		Levine-Fricke October 15, 1993
23	Removed		Levine-Fricke October 15, 1993
24	Removed	1,000-gallon UST removed in 1987.	Levine-Fricke October 15, 1993 Geomatrix May 8, 1995
25	Removed	Crude oil tank (1909 - 1960) also in vicinity.	Levine-Fricke October 15, 1993 Geomatrix May 8, 1995
26	Unknown	No indication of tank based on ENVIRON environmental assessment of property (location from Levine-Fricke report).	Levine-Fricke October 15, 1993 ENVIRON June 11, 1997
27	Removed	10,000-gallon diesel tank removed May 1997.	Levine-Fricke October 15, 1993 ENVIRON June 11, 1997

(Continued)

TABLE I.3 (Continued)

Map Location /a/	Status	Comments	References /b/
28	Removed	500-gallon waste oil tank removed 1990.	Levine-Fricke October 15, 1993 ENVIRON June 11, 1997
29,30	Removed	One 10,000-gallon diesel tank and one 5,000-gallon gasoline/diesel tank removed May 1993.	Levine-Fricke October 15, 1993 Baseline August 1993
31	Removed	400-gallon diesel tank removed February 1993.	Levine-Fricke October 15, 1993 Baseline April 1993
32	Removed		Levine-Fricke October 15, 1993
33	Removed	Tank removed May 1997.	Levine-Fricke October 15, 1993 Verbal communication from current property tenant.
34	Existing	Inactive, suspected UST within concrete pad; partially filled with hydrocarbon-like liquid.	ERM-West March 1997
35	Existing	Inactive, underground concrete vault containing water and hydrocarbons.	ERM-West March 1997
36,37, 38	Removed	One 1,000-gallon diesel tank, and two 10,000-gallon gasoline tanks removed January 1990.	Levine-Fricke March 15, 1990 Levine-Fricke October 15, 1993 ENVIRON October 29, 1996 RWQCB February 20, 1997b
39	Removed		Levine-Fricke October 15, 1993
40	Removed		Levine-Fricke October 15, 1993

(Continued)

TABLE I.3 (Continued)

Map Location /a/	Status	Comments	References /b/
41	Abandoned/ Removed		Levine-Fricke October 15, 1993
42	Removed	One approximately 13,000-gallon tank removed November 1997.	ENVIRON summary report in progress
43	Abandoned/ Removed		Levine-Fricke October 15, 1993

Notes:

- See Figure V.J.2 in SEIR Section V.J, Contaminated Soils and Groundwater, for the location of underground storage tanks.
- References (listed below) include removal/investigation reports as well as reports that reference location of tanks.

Source: Compiled from the following documentary ENVIRON International, February 1998.

- Baseline Environmental Consulting. 1993. *Report on Underground Tank Removal, 300 16th Street*. April.
- Baseline Environmental Consulting. 1993. *Report and Work Plan, Underground Tank Removal, 300 16th Street*. August.
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Soil Boring and Monitoring Well Installation

Drilling Procedures

Fourteen soil borings and monitoring wells were drilled and installed by Gregg Drilling Services of Martinez, California, using a Mobil B-53 hollow-stem auger rig. Soil borings completed as 4-inch-diameter monitoring wells (seven total) were advanced with 6-1/4-inch outside diameter (OD) augers and reamed with 10-1/4-inch OD augers. Soil borings completed as 2-inch-diameter monitoring wells (seven total) were both advanced and reamed with 8-1/4-inch OD augers.

An ENVIRON geologist was present during drilling to obtain samples of subsurface materials, maintain a log of the borings, make observations of the work area conditions, conduct health and safety monitoring for possible organic vapors during drilling, screen and log soil samples, and provide technical assistance as required. Relatively undisturbed soil samples were obtained using a 2-inch inside diameter (ID) split-spoon sampler. From each boring, soil samples were collected for chemical testing near the surface and from halfway between the surface and the groundwater table. Due to variations in undisturbed sample recovery and encountered groundwater elevations, shallow sample depths ranged from 0.5 to 2.5 feet below ground surface, and deeper sample depths ranged from 2.5 feet to 5.0 feet below ground surface. Samples were also taken from selected wells for physical testing at depths ranging from 11.5 to 15.0 feet below ground surface.

To collect a sample, the split-spoon sampler was driven into undisturbed soils using a hammer weighing 140 pounds and falling 30 inches. The soil samples were retained in pre-cleaned 6-inch-long stainless steel liner tubes. Prior to collecting each sample, the sampler was cleaned with Liquinox™ in water solution, then double rinsed with potable water, and reassembled with pre-cleaned stainless steel tubes. During the field program, two equipment blanks were taken. Deionized water was poured through the clean split-spoon sampler (with stainless steel sleeves) directly into sample containers. The equipment blank samples were immediately placed into coolers and transported to the laboratory following chain-of-custody protocols.

Well Installation Procedures

The wells were installed with either 2-inch- or 4-inch-diameter Schedule 40 PVC casing and screen (0.010-inch slot size), and fitted with a threaded PVC end cap. A locking expansion cap was placed on top of each well casing. Lonestar #2/12 sand or Lonestar #2/16 sand filter packs were placed in the annulus from the bottom of the borehole to approximately one foot above the top of the slotted screen (approximately 4.5 feet below ground surface). Filter pack size was chosen to correspond to

observed lithologies within the screened interval. After installation of the sand filter pack, a bentonite pellet seal was added for a minimum thickness of 1 foot. An annular seal of cement or bentonite was placed on top of the bentonite pellet seal.

Monitoring wells MW-1 through MW-6 and MW-8 through MW-11 were finished with lockable metal standpipes that were cemented into place to a height of approximately three feet above ground surface. Monitoring wells MW-7, MW-12, MW-13, and MW-14 were finished with flush-mounted traffic-rated Christie boxes. To protect wells MW-1 through MW-6 from ongoing site development and construction activities, each was flanked with three metal stanchions. Wells MW-8 through MW-11 were protected using portable lighted traffic barricades.

Well Development

Blaine Technical Services, Inc. (Blaine Tech), of San Jose, California, performed well development on January 2 and 3, 1997, under the oversight of ENVIRON field staff. Well development procedures consisted of swabbing, surging, and pumping activities.

Well Sampling

Groundwater sampling was conducted by Blaine Tech under the oversight of ENVIRON field staff. Prior to sampling the wells, the water level and total depth of well were measured and the casing volume was calculated.

A minimum of three casing volumes of water was purged from each well prior to sampling to ensure that the sample represented aquifer conditions as much as possible. Monitoring wells MW-12, MW-13, and MW-14 dewatered during purging and were sampled after two, two, and one casing volumes, respectively. The wells were purged using either a Middleburg displacement pump or similar pump built by Blaine Tech, or a Grunfos submersible pump. Pump selection was based on well diameter, filter pack size, lithology, and anticipated recharge rates.

When water quality parameters had stabilized and, where possible, a minimum of three casing volumes of water had been evacuated from the well, a groundwater sample was collected for chemical analysis using a decontaminated (steam-cleaned) stainless steel bailer gently lowered down the well by hand. The sampling bailer had a small pouring port near the top of the bailer that allowed for controlled pouring of samples, minimizing aeration.

Following collection, all groundwater and quality control samples were placed in coolers containing ice. Samples were transported to Curtis & Tompkins, Ltd., of Berkeley, California, for analysis under chain-of-custody protocol.

Mission Bay South

From April 21, 1997, to June 24, 1997, a subsurface field investigation was conducted in Mission Bay South by ENVIRON International Company for Catellus Development Corporation. The following section discusses the scope of work of the field investigation.

Soil and groundwater samples were collected from a total of 111 borings and temporary monitoring wells as part of an investigation designed to assess whether or not chemicals of concern were present in the shallow soils and groundwater in the Mission Bay South area. Groundwater level measurements were also collected from temporary monitoring wells in order to evaluate groundwater flow patterns in the area.

An ENVIRON geologist was present during all field work to obtain samples of subsurface materials, maintain a log of borings, make observations of the work area conditions, conduct health and safety monitoring of possible organic vapors encountered during drilling and/or sampling, screen and log soil samples, and provide technical assistance as required. All field work for the investigation was conducted under the supervision of a California registered geologist.

Soil Investigation

A total of 111 soil borings were advanced in the Mission Bay South area to the top of groundwater using hollow-stem auger methods. Boring locations were selected in order to screen the Mission Bay South area for potential chemicals of concern. A description of the soil investigation area is presented below.

Soil Sample Collection

Two soil samples were collected from nearly every boring (100 out of 111 borings) to provide information on the possible vertical extent of chemicals. Due to the presence of debris, concrete, or railroad base rock, only one soil sample was collected from borings C33, C39, SF31, UC10, and UC14. (See Figure V.J.4 for locations of borings and monitoring wells.) In concurrence with the City and County of San Francisco, one boring (SF32), located on the parcel southeast of the intersection of Third and Fourth Streets, was advanced for the collection of a groundwater sample

only. Soil samples were not collected from boring locations MW-C42, MW-C43, MW-C44, MW-C45, and MW-SF35 because these borings were included in the program to further investigate the extent of petroleum hydrocarbons encountered in local groundwater on port property in the southeast corner of the Project Area.

Except for the borings detailed above, a shallow surface soil sample was collected from a depth of approximately 0.5 to 1.5 feet below ground surface and a second soil sample was collected from a depth approximately half the distance from ground surface to the top of the water table. Since the top of the water table ranged from approximately 4 to 9 feet below ground surface in the Mission Bay South area, the depth of the second soil sample varied.

Soil Analytical Program

Soil samples collected during the investigation were tested for various chemical compounds associated with historical usage of the Mission Bay South area. Table I.2 provides a summary of historical usage of each parcel in Mission Bay South as well as a listing of possible chemicals of concern based on previous land use. Chemicals of concern for the Mission Bay South area based on historical usage are presented in the *Mission Bay Hazards Mitigation Plan/1/* and are summarized in Table V.J.1 in this SEIR.

Due to the comprehensive nature of the investigation, all soil samples collected during the investigation were analyzed using U.S. EPA test protocols. Shallow soil samples were not tested for volatile organic compounds (VOCs) because volatile compounds do not tend to persist in surface soils. At the request of the City and County of San Francisco, soil samples collected from three borings located on the parcel southeast of the intersection of Third and Fourth Streets were also tested using the California waste extraction test (WET) for lead.

Physical Testing

Samples of the subsurface soils obtained during drilling were tested to evaluate their physical properties. Selected samples were submitted for grain size analysis, soil classification, Atterberg Limits, porosity, moisture content and dry density, and total organic carbon.

Groundwater Investigation

Groundwater samples were collected from borings and temporary monitoring wells installed during the Mission Bay South subsurface investigation. A description of the groundwater investigation conducted in the area is presented below.

Groundwater Grab Sample Collection

One-time groundwater grab samples were collected from 71 of the 76 soil borings located in the south of Channel area. With the concurrence of the City, three borings (SF31, SF33, and SF34) were not sampled for groundwater due to the close proximity of other groundwater sample locations. No groundwater was encountered in boring C29 despite deepening the boring through bedrock to 20 feet below ground surface and leaving the hole open overnight to collect any available groundwater. Due to its location in a narrow alley, boring SF26 was drilled with a limited access rig, which was unable to penetrate shallow bedrock and reach groundwater. Groundwater grab samples were, therefore, not collected from these two locations.

Grab groundwater samples were collected using either a Hydropunch™ system or PVC casing encased in a polyester filter sock to prevent sediment infiltration. Groundwater grab sampling was initially attempted using the Hydropunch™ method; however, if the aquifer yield proved insufficient to provide enough sample volume, or if lithologic conditions prevented the advancement of the Hydropunch™ tool, the alternative temporary casing method was used.

Well Installation and Groundwater Sample Collection

A total of 35 of the 111 soil borings were completed as temporary groundwater monitoring wells. With the exception of two locations, all wells were installed to a depth of approximately 15 feet below ground surface using 2-inch-diameter Schedule 40 PVC casing and a 10-foot section of screen (0.010-inch slot size) fitted with a threaded PVC end cap. Well MW-SF7 was installed to a total depth of 10.5 feet below ground surface (with a 50-foot section of screen) due to difficult drilling conditions at that location. Well MW-C45 was installed to a depth of 28.5 feet below ground surface (with a 5-foot section of screen) to evaluate the chemical concentrations in a lower water-bearing zone. Due to the petroleum hydrocarbons encountered in the shallow aquifer near well MW-C45, a steel conductor casing was installed at this location to prevent chemicals from moving to the deeper unit. A mud rotary rig was used to drill the borehole and install the conductor casing at well MW-C45.

Following installation, the wells were developed to provide groundwater samples relatively free of sediment and 34 of the 35 wells were sampled to quantify concentrations of chemicals in groundwater in the Mission Bay South area. Due to the thickness and viscosity of free product in well MW-C9, ENVIRON was unable to lower a bailer down the well to recover a groundwater sample.

Groundwater Analytical Program

Groundwater samples were tested for potential chemicals of concern in the Mission Bay South area. The groundwater samples were analyzed for compounds associated with historical usage as shown in Table I.2. Chemicals of concern for the Mission Bay South area, based on historical usage, are presented in Table V.J.1. The chemical testing protocol for the investigation was developed based on historical usage of the Mission Bay South area. All groundwater samples collected during the investigation were analyzed using that testing protocol.

Groundwater samples were not tested for pesticides and polychlorinated biphenyls (PCBs) due to their tendency to adhere tightly to soils, and their subsequent immobility. Groundwater samples were also not tested for asbestos because that compound is only considered hazardous if capable of being inhaled. At the request of the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), groundwater samples from wells MW-C8, MW-C10, MW-SF6, MW-SF7, MW-SF9, and MW-UC6 were tested for nitrate to evaluate natural bioremediation potential in the vicinity of these wells.

Groundwater Elevation Measurements

In order to evaluate flow conditions, groundwater levels were measured in all 35 monitoring wells. Three separate water level monitoring events were conducted at the Mission Bay South area over the course of one day to assess short-term fluctuations of the shallow water table due to tidal changes: one round of measurements was collected at approximately the same time as high tide, one round of measurements was collected at approximately the same time as low tide, and one round of measurements was collected between high tide and low tide times (mid-ebb tide).

Laboratory Methods for Sample Analysis

Samples collected from Mission Bay North and Mission Bay South were analyzed as follows:

- Volatile organic compounds (U.S. EPA Method 8260, for the Method 8240 list of compounds)
- Semivolatile organic compounds (U.S. EPA Method 8270)
- Pesticides and PCBs (U.S. EPA Method 8080)
- Metals (antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc by U.S. EPA Methods 6010/6020/7470; hexavalent chromium (Cr VI) in soils by U.S. EPA Method

7196; Waste Extraction Test for lead for samples collected from borings SF31, SF33, and SF34 - see Figure V.J.4 for locations)

- Total petroleum hydrocarbons - gasoline fraction (U.S. EPA 8015, modified)
- Total petroleum hydrocarbons - diesel and motor oil fractions (U.S. EPA Method 8015, modified. Silica-gel column cleanup performed on Mission Bay South samples)
- Asbestos (Polarized Light Microscopy)
- Nitrate (U.S. EPA Method 300)

SUMMARY OF SOIL AND GROUNDWATER SAMPLING RESULTS

Results of a comprehensive program of soil sampling and analysis in Mission Bay carried out in 1996 and 1997 are summarized below. Unless otherwise noted, the reported concentrations of chemicals in soil and groundwater and the interpretation of the results are summarized from the 1997 Mission Bay North report and 1998 Mission Bay South report, both prepared by ENVIRON for Catellus./2/

Mission Bay North Soil Results

Results of soil sampling in Mission Bay North are summarized in Tables I.4 through I.10. Each table lists the chemical detected, the range of concentrations, and the number of detections of each chemical compared to the number of total samples. In addition, Figures V.J.5 through V.J.8 show the locations of borings where some of these chemicals were detected and the concentrations of those chemicals. A narrative summary of this information is provided below.

Volatile Organic Compounds

Acetone was the only volatile organic compound (VOC) detected in soil; it was detected in 4 out of 14 soil samples collected, three of which are in borings located south of King Street and one of which is north of King Street in the Project Area (see Figure V.J.5). Concentrations ranged from 25 micrograms per kilogram ($\mu\text{g}/\text{kg}$) to $71\mu\text{g}/\text{kg}$ at depths of 2.5 to 4.5 feet as listed in Table I.4. Acetone is a chemical used in analytical laboratory processes. It is possible that some of these results may be from the laboratory analyses, rather than actual detections in soil./3/ VOCs were not detected in soil borings adjacent to the China Basin Channel.

TABLE I.4
DETECTION OF VOLATILE ORGANIC COMPOUNDS (VOCs) IN SOIL

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/b/	Concentration Range (µg/kg)
Mission Bay North				
Acetone /c/	14	4	29%	25-71
Mission Bay South				
Freon 113	105	1	1%	8.2
Freon 11	105	1	1%	5
2-Butanone	105	9	9%	11 - 120
2-Hexanone	105	1	1%	16
Acetone /c/	105	24	23%	14 - 770
Benzene	105	6	6%	13 - 270
Carbon Disulfide	105	5	5%	5.2 - 43
Chloroform	105	1	1%	6.2
Ethylbenzene	105	5	5%	7.3 - 2,700
Methylene Chloride /c/	105	12	11%	10 - 110
Styrene	105	1	1%	51
PCE	105	1	1%	11
Toluene	105	11	10%	5 - 4,300
TCE	105	1	1%	110
m & p-Xylenes	105	7	7%	5 - 8,000
o-Xylene	105	5	5%	5 - 4,900

Notes:

µg/kg = micrograms per kilogram

PCE = Tetrachloroethene

TCE = Trichloroethene

- a. Shallow soil samples were not tested for volatile organic compounds since it is unlikely these compounds would persist in surface soils due to their volatile nature.
- b. Number of detections as a percent of the total number of samples.
- c. Common laboratory contaminant.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 6.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-7.

Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs) were detected in 6 of 28 soil samples from five borings in Mission Bay North (see Figures V.J.6 and 7). With the exception of 4-methylphenol found in soil boring MW-8 (south of King Street, about 300 feet east of Seventh Street) and dibenzofuran in a soil sample from MW-5 (near Fifth Street just north of the Channel edge), the SVOCs detected were PAHs. (See Table I.5 for SVOCs detected that are not PAHs and Table I.6 for PAHs detected in soil.) PAHs are typically associated with heavy-end fuels and the combustion of organic material (such as coal and gas) and are pervasive at industrial sites. They are generally found tightly bound to soils.

Carcinogenic (cancer-causing) and noncarcinogenic PAHs were detected in the soil samples. Carcinogenic PAHs included benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3,-cd)pyrene. Concentrations of these compounds ranged from 340 to 9,900 micrograms per kilogram ($\mu\text{g/kg}$) (see Table I.6).

Noncarcinogenic PAHs that were detected included acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. Detected concentrations for these PAHs ranged from 390 to 20,000 $\mu\text{g/kg}$ (see Table I.6).

Total Petroleum Hydrocarbons

A total of 28 soil samples (2 samples from each of the 14 soil borings), were tested for TPH gasoline, diesel, and motor oil fractions during the investigation. TPH-gasoline was not found above a detection limit of 1.0 milligrams per kilogram (mg/kg) in soil in any of the soil samples collected. TPH-diesel and TPH-motor oil were detected in every soil boring in Mission Bay North. Twenty-five of the 28 soil samples had diesel and motor oil concentrations ranging from 2.7 mg/kg to 240 mg/kg and 9 mg/kg to 2,800 mg/kg , respectively (see Table I.7).

Polychlorinated Biphenyls and Pesticides

Two soil samples collected from each of the 14 borings were tested for polychlorinated biphenyls (PCBs) and pesticides. One PCB (Arochlor 1254) was detected in a soil boring sample from MW-5, adjacent to Fifth Street at the Channel (see Figure V.J.8) at a concentration of 390 $\mu\text{g/kg}$ (see Table I.8). No PCBs were detected in a deeper sample from this boring or any of the other boring locations.

TABLE I.5
DETECTIONS OF SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs) IN SOIL

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/a/	Concentration Range (µg/kg)
Mission Bay North				
4-methylphenol	28	1	4 %	460
Dibenzofuran	28	1	4 %	1,800
Mission Bay South				
Dibenzofuran	205	1	< 1 %	2,000

Notes:

µg/kg = micrograms per kilogram

< = less than

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 6.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-5.

Components of the pesticide DDT (4',4-DDD and 4',4-DDT) were detected in samples at concentrations of 7.3 µg/kg and 18 µg/kg at MW-9 (northeast of Sixth and Berry Streets) and MW-4 (at the southwest corner of Fifth and Berry Streets), respectively, as shown in Figure V.J.8.

Metals

Twenty-eight samples from the 14 soil borings were tested for 18 metals. Metals were detected in all 28 samples. The ranges of metals detections are listed in Table I.9. Arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, vanadium, and zinc were detected in 75 % of the samples tested. The higher concentrations of antimony, lead, mercury, and zinc were limited to soils collected from five of the 14 borings (MW-2, MW-4, MW-8, MW-9, and MW-14 [see Figure V.J.4 for boring locations]). The highest concentration of antimony and zinc (140 mg/kg and 6,500 mg/kg, respectively) were detected in MW-14, located west of Third Street and south of Townsend Street. Levels of mercury were highest in boring MW-8, between Sixth and Seventh Streets and south of Townsend Street. The maximum lead concentration detected in the soil was in one boring (MW-9), at 430 mg/kg.

TABLE I.6
DETECTIONS OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN SOIL

Compound	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Concentration Range (µg/kg)
Mission Bay North				
<i>Noncarcinogenic</i>				
Acenaphthene	28	1	4%	2,900
Anthracene	28	1	4%	6,900
Benzo(g,h,i)perylene	28	3	11%	360 - 2,000
Fluoranthene	28	5	18%	390 - 17,000
Naphthalene	28	1	4%	2,400
Phenanthrene	28	3	11%	600 - 17,000
Pyrene	28	5	18%	580 - 20,000
<i>Carcinogenic</i>				
Benzo[a]pyrene	28	5	18%	420 - 7,800
Benzo[b]fluoranthene	28	3	11%	730 - 5,000
Benzo[k]fluoranthene	28	5	18%	370 - 7,700
Benz[a]anthracene	28	4	14%	850 - 9,300
Chrysene	28	5	18%	380 - 9,900
Indeno[1,2,3-cd]pyrene	28	3	11%	340 - 1,800
Mission Bay South				
<i>Noncarcinogenic</i>				
2-Methylnaphthalene	205	1	< 1%	1,100
Acenaphthene	205	1	< 1%	1,600
Acenaphthylene	205	2	1%	1,700 - 2,100
Anthracene	205	2	1%	2,500 - 6,900
Benzo(g,h,i)perylene	205	4	2%	340 - 2,600
Fluoranthene	205	10	5%	330 - 7,700
Fluorene	205	1	< 1%	2,900
Naphthalene	205	1	< 1%	1,500
Phenanthrene	205	14	7%	330 - 17,000
Pyrene	205	10	5%	370 - 14,000
<i>Carcinogenic</i>				
Benz[a]anthracene	205	7	3%	350 - 11,000
Benzo[a]pyrene	205	8	4%	390 - 8,700
Benzo[b]fluoranthene	205	13	6%	340 - 9,600
Benzo[k]fluoranthene	205	5	2%	410 - 3,000
Chrysene	205	8	4%	430 - 6,800
Dibenz[ah]anthracene	205	1	< 1%	460
Indeno[1,2,3-cd]pyrene	205	4	2%	330 - 3,200

Notes:

µg/kg = micrograms per kilogram

< = less than

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 6.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-4.

TABLE I.7
DETECTIONS OF TOTAL PETROLEUM HYDROCARBONS (TPHs) IN SOIL

Compound	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Concentration Range (mg/kg)
Mission Bay North				
TPH Gasoline Range	28	0	0%	ND < 1.0
TPH Diesel Range	28	25	89%	2.7 - 240
TPH Motor Oil	28	25	89%	9.0 - 2,800
Mission Bay South				
TPH Gasoline Range	205	13	6%	1.2 - 490
TPH Diesel Range	205	51	25%	1.9 - 12,000
TPH Motor Oil Range	205	116	57%	5 - 4,300

Notes:

mg/kg = milligrams per kilogram

ND < 1.0 = Non-detect at a detection limit of 1.0 mg/kg.

TPH Gasoline Range = Includes compounds identified as total petroleum hydrocarbons (TPH) gasoline as well as hydrocarbons in the unknown volatile hydrocarbon range.

TPH Diesel Range = Includes compounds identified as TPH diesel as well as unknown hydrocarbons in the diesel range.

TPH Motor Oil Range = Includes compounds identified as TPH motor oil as well as unknown hydrocarbons in the motor oil range.

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 8.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-11.

Other Analyses/General Chemistry

Sulfide and cyanide, analyzed as part of the Article 20 list of chemicals to be tested, were not detected in any soil samples collected during the investigation. Chrysotile asbestos was detected in one sample at a concentration of 1 to 5% (see Table I.10). The asbestos was believed to be related to pieces of roofing material contained in the sample rather than to the soil.

Soil samples were also tested for flammability (ignitability) and methane. The results indicated that the material would not be classified as ignitable, and reported concentrations of methane ranged from 5.2 parts per million by volume (ppmv) to 11 ppmv. These concentrations are equivalent to 0.00052% methane to 0.0011% methane, which is well below the explosive range for methane (5 to 14%).

TABLE I.8
DETECTIONS OF PESTICIDES AND PCBs IN SOIL

Compound	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Concentration Range (µg/kg)
Mission Bay North				
4,4' - DDD	28	1	4%	7.3
4,4' - DDT	28	1	4%	18
PCB (Aroclor - 1254)	28	1	4%	390
Mission Bay South				
Aldrin	205	1	< 1%	160
Dieldrin	205	1	< 1%	120
Endosulfan I	205	1	< 1%	160
Endrin	205	1	< 1%	31
HCH (gamma) Lindane	205	1	< 1%	160
Heptachlor	205	1	< 1%	160
Heptachlor Epoxide	205	2	1%	12 - 160

Notes:

µg/kg = micrograms per kilogram

Polychlorinated biphenyls (PCBs) were not detected in soil samples collected during the South of Channel investigation.

< = less than

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 6.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-3.

Mission Bay North Groundwater Results

Results of groundwater sampling performed in Mission Bay North are summarized in Tables I.11 through I.15. Each table lists the chemical detected, the range of concentrations, and the number of detections of each chemical compared to the number of total samples. In addition, Figures V.J.6, and V.J.9 through V.J.13 show the location of monitoring wells where some chemicals were detected and the concentrations of those chemical. A summary of this information is provided below.

TABLE I.9
DETECTIONS OF METALS IN SOIL

Compound	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Concentration Range (mg/kg)
Mission Bay North				
Antimony	28	3	11%	6 - 140
Arsenic	28	28	100%	1 - 16
Barium	28	28	100%	15 - 1,100
Beryllium	28	25	89%	0.099 - 1.3
Cadmium	28	28	100%	0.32 - 2.2
Chromium	28	28	100%	12 - 75
Chromium VI	28	4	14%	0.11 - 0.19
Cobalt	28	28	100%	3 - 16
Copper	28	27	96%	0.78 - 220
Lead	28	28	100%	2.2 - 430
Mercury	28	21	75%	0.099 - 3.6
Molybdenum	28	2	7%	1.2 - 1.6
Nickel	28	28	100%	12 - 100
Selenium	28	26	93%	0.37 - 3
Silver	28	4	14%	0.58 - 0.83
Thallium	28	19	68%	0.31 - 3.1
Vanadium	28	28	100%	18 - 56
Zinc	28	28	100%	16 - 6,500
Mission Bay South				
Antimony	205	16	8%	6.2 - 325
Arsenic	205	183	89%	1.1 - 247
Barium	205	204	100%	2.0 - 5,250
Beryllium	205	120	59%	0.2 - 4.7
Cadmium	205	52	25%	0.52 - 15.2
Chromium	205	205	100%	6.4 - 1,710
Chromium VI	205	14	7%	0.05 - 4.4
Cobalt	205	204	100%	2.0 - 119
Copper	205	204	100%	2.9 - 3,520
Lead	205	192	99%	1.2 - 47,900
Mercury	205	128	62%	0.1 - 32.7
Molybdenum	205	8	4%	2.1 - 8.6
Nickel	205	204	100%	7.8 - 2,650
Selenium	205	1	<1%	0.88

(Continued)

TABLE I.9 (Continued)

Compound	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Concentration Range (mg/kg)
Mission Bay South (cont.)				
Silver	205	15	7%	1.0 - 4.6
Thallium	205	2	1%	0.78 - 1.0
Vanadium	205	205	100%	8.9 - 218
Zinc	205	205	100%	11 - 3,880

Notes:

mg/kg = milligrams per kilogram

ND = not detected

< = less than

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 13.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-9.

Volatile Organic Compounds

Volatile organic compounds (VOCs) were detected in 7 out of 14 groundwater samples collected in the Mission Bay North Project Area (see Figure V.J.9). Benzene at a concentration of 7 micrograms per liter ($\mu\text{g/L}$) was detected in samples collected from one monitoring well (MW-11 located about 200 feet west of Fourth Street between King and Berry Streets). Two chemicals, cis-1,2-dichloroethene and trichloroethylene (TCE), were detected in MW-10 (about 200 feet east of Fifth Street between King and Berry Streets). Tetrachloroethene (PCE) was also detected in MW-10 at a concentration of 180 $\mu\text{g/L}$ (see Table I.11 for a list of the ranges of VOCs in groundwater).

VOC concentrations in groundwater were not widespread. There appeared to be no pattern in levels of contamination, and the VOC concentrations did not correlate well with chemical concentrations in soil. This suggests that there is not a specific identifiable source area for VOC contamination in Mission Bay north of the Channel. The one location where BTEXs were detected in groundwater is likely attributed to the former UST on the Caltrain property located upgradient of Mission Bay North. VOCs near the Channel were found in low concentrations or were not detected.

**TABLE I.10
DETECTIONS OF ASBESTOS IN SOIL**

Area	Total Number of Samples	Number of Detections	Frequency of Detections/a/	Amount
Mission Bay North				
	14	1	7%	1-5%
Mission Bay South				
	205	29	14%	Trace (<1%)
	205	9	4%	1 - 5%
	205	6	3%	5 - 10%
	205	3	1%	10 - 30%
	205	2	1%	65 - 75%

Note:

a. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 6.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-14.

Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs) were detected in 3 of 14 groundwater samples, as shown in Figures V.J.6 and Figure V.J.10. Tables I.12 and I.13 show the numbers of detections and ranges of concentrations for SVOCs that are not PAHs and those that are PAHs, respectively. In groundwater samples collected from MW-9 (300 feet east of Sixth Street between King and Berry Streets) and MW-13 (west of Third and south of King Streets), one SVOC, bis(2-ethylhexyl)phthalate (DEHP), was detected at concentrations of 12 µg/L and 13 µg/L, respectively. DEHP is a common field and laboratory contaminant; therefore it is possible that groundwater in this area has little or no DEHP. One other SVOC, dibenzofuran, was detected in one sample, at 450 µg/L.

Samples from MW-11 contained five PAHs: naphthalene was detected at 5,500 µg/L; acenaphthene was detected at 830 µg/L; and fluorene was detected at a concentration of 520 µg/L. Phenanthrene was found at 690 µg/L and 2-methylnaphthalene at 1,400 µg/L.

SVOCs in the groundwater in Mission Bay North are not widespread, and the locations and concentrations suggest there is no identifiable source area of contamination.

TABLE I.11
DETECTIONS OF VOLATILE ORGANIC COMPOUNDS (VOCs) IN GROUNDWATER

Compound	Total Number of Samples /a/	Number of Detections	Frequency of Detections/b/	Concentration Range (µg/L)
Mission Bay North				
cis-1,2-DCE	14	1	7%	7.1
trans-1,2-DCE	14	1	7%	2.6
Benzene	14	1	7%	7.4
Carbon Disulfide	14	5	36%	1.1 - 14
Chloroform	14	1	7%	1.8
Ethylbenzene	14	1	7%	47
PCE	14	2	14%	2.8 - 180
Toluene	14	1	7%	16
TCE	14	1	7%	7.0
m & p-Xylenes	14	1	7%	46
o-Xylene	14	1	7%	43
Mission Bay South				
TCA	105	2	2%	1.5 - 2.6
1,1-DCA	105	1	1%	1.5
cis-1,2-DCE	105	1	1%	31
trans-1,2-DCE	105	1	1%	6.9
Acetone/c/	105	1	1%	5.5
Benzene	105	9	9%	1.0 - 240
Carbon Disulfide	105	3	3%	1.3 - 8.7
Chlorobenzene	105	1	1%	5.0
Chloroform	105	4	4%	1.0 - 23
Ethylbenzene	105	3	3%	1.3 - 2.4
PCE	105	1	1%	1.3
Toluene	105	4	4%	1.0 - 41
TCE	105	1	1%	3.6
m & p-Xylenes	105	7	7%	1.6 - 34
o-Xylene	105	3	3%	2.5 - 12
Vinyl Chloride	105	1	1%	38

Notes:

µg/L = micrograms per liter

TCA = 1,1,1-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

cis-1,2-DCE = cis-1,2-Dichloroethene

trans-1,2-DCE = trans-1,2-Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

- a. Duplicate samples were not counted as additional samples. For the duplicate samples, a detection in either the primary or duplicate sample was called a detection. The higher of the two results is reported in the range.
- b. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 7.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-8.

TABLE I.12
DETECTIONS OF SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs) IN GROUNDWATER

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/b/	Concentration Range (µg/L)
Mission Bay North				
DEHP/b/	14	2	14%	12-13
Dibenzofuran	14	1	7%	450
Mission Bay South				
2,4-Dimethylphenol	105	1	1%	47
2-Methylphenol	105	1	1%	33
4-Methylphenol	105	1	1%	79
DEHP/b/	105	1	1%	31
Phenol	105	1	1%	13

Notes:

µg/L = micrograms per liter

- a. Duplicate samples were not counted as additional samples. For the duplicate samples, a detection in either the primary or duplicate sample was called a detection. The higher of the two results is reported in the range.
- b. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 7.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-5.

Total Petroleum Hydrocarbons

A total of 14 groundwater samples were tested for total petroleum hydrocarbons (TPHs) in gasoline, diesel, and motor oil fractions (see Figures V.J.11, V.J.12, and V.J.13). TPH-gasoline was detected at a concentration of 8.3 milligrams per liter (mg/L) in MW-11. TPH-diesel was detected in groundwater samples from all 14 wells in concentrations ranging from 0.055 mg/L to 48 mg/L (see Table I.14). In areas sampled near China Basin Channel, concentrations ranged from 0.055 mg/L to 0.92 mg/L. The highest concentration, 48 mg/L, was found in MW-11, located downgradient from the Caltrain property near Fourth and King Streets. Seven of the 14 wells sampled contained TPH-motor oil. Concentrations ranged from 0.39 mg/L to 7.1 mg/L. As with the other TPH fractions, MW-11 had the highest concentration.

TABLE I.13
DETECTIONS OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN GROUNDWATER

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/b/	Concentration Range (µg/L)
Mission Bay North				
<i>Noncarcinogenic</i>				
2-Methylnaphthalene	14	1	7%	1,400
Acenaphthene	14	1	7%	830
Fluorene	14	1	7%	520
Naphthalene	14	1	7%	5,500
Phenanthrene	14	1	7%	690
<i>Carcinogenic</i>				
none	14	0	0%	0
Mission Bay South				
<i>Noncarcinogenic</i>				
2-Methylnaphthalene	105	1	1%	270
Acenaphthene	105	3	3%	11 - 120
Fluoranthene	105	1	1%	32
Naphthalene	105	3	3%	17 - 1,400
Phenanthrene	105	3	3%	11 - 120
Pyrene	105	2	2%	13 - 42
<i>Carcinogenic</i>				
Benzo[b]fluoranthene	105	1	1%	22

Notes:

µg/L = micrograms per liter

- a. Duplicate samples were not counted as additional samples. For the duplicate samples, a detection in either the primary or duplicate sample was called a detection. The higher of the two results is reported in the range.
- b. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 7.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-6.

Metals

Twelve metals (antimony, arsenic, barium, chromium, cobalt, lead, mercury, molybdenum, nickel, thallium, vanadium, and zinc) were detected in groundwater in Mission Bay North. Arsenic, barium, and zinc were detected most frequently while antimony, chromium, cobalt, molybdenum, and vanadium were detected rarely (see Table I.15). Three metals detected in higher concentrations than

TABLE I.14
DETECTIONS OF TOTAL PETROLEUM HYDROCARBONS (TPHs) IN GROUNDWATER

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/b/	Concentration Range (mg/L)
Mission Bay North				
TPH Gasoline Range	14	1	7%	8.3
TPH Diesel Range	14	14	100%	0.055 - 48
TPH Motor Oil Range	14	7	50%	0.39 - 7.1
Mission Bay South				
TPH Gasoline Range	105	17	16%	0.052 - 36
TPH Diesel Range	105	40	38%	0.068 - 330
TPH Motor Oil Range	105	30	29%	0.13 - 4.7

Notes:

µg/L = micrograms per liter

TPH Gasoline Range = Includes compounds identified as total petroleum hydrocarbons (TPH) gasoline as well as hydrocarbons in the unknown volatile hydrocarbon range.

TPH Diesel Range = Includes compounds identified as TPH diesel as well as unknown hydrocarbons in the diesel range.

TPH Motor Oil Range = Includes compounds identified as TPH motor oil as well as unknown hydrocarbons in the motor oil range.

- a. Duplicate samples were not counted as additional samples. For the duplicate samples, a detection in either the primary or duplicate sample was called a detection. The higher of the two results is reported in the range.
- b. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, April 1997, Table 9.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-12.

in other locations included antimony (0.2 mg/L in MW-10); nickel (0.190 mg/L in MW-13); and thallium (0.010 to 0.028 mg/L in MW-9, MW-10, and MW-13). Monitoring well locations are shown in Figure V.J.4. The data indicate that there is no specific pattern of metals in groundwater that would indicate a specific identifiable source area in Mission Bay North./4/

Mission Bay South

The Mission Bay South investigation was conducted from April 21 to June 24, 1997, including the Atcheson, Topeka and Santa Fe Railroad area. The study area included all Mission Bay South parcels owned by Catellus or by City agencies except the Channel Pump Station site. Parcels owned or operated by Esprit de Corp and Castle Metals were investigated independently; the results of the

**TABLE I.15
DETECTIONS OF METALS IN GROUNDWATER**

Compound	Total Number of Samples/a/	Number of Detections	Frequency of Detections/b/	Concentration Range (mg/L)
Mission Bay North				
Antimony	14	1	7%	0.220
Arsenic	14	10	71%	0.0057 - 0.038
Barium	14	14	100%	0.015 - 0.270
Beryllium	14	0	0%	--
Cadmium	14	0	--	--
Chromium	14	1	7%	0.013
Cobalt	14	2	14%	0.021 - 0.110
Copper	14	0	--	--
Lead	14	3	21%	0.0044 - 0.013
Mercury	14	5	36%	0.0002 - 0.0027
Molybdenum	14	1	7%	0.031
Nickel	14	3	21%	0.024 - 0.190
Selenium	14	0	--	--
Silver	14	0	--	--
Thallium	14	3	21%	0.010 - 0.028
Vanadium	14	1	7%	0.018
Zinc	14	11	79%	0.021 - 0.180
Mission Bay South				
Antimony	105	2	2%	0.061 - 0.064
Arsenic	105	80	76%	0.002 - 0.170
Barium	105	104	99%	0.018-9
Beryllium	105	0	0%	--
Cadmium	105	2	2%	0.0014 - 0.006
Chromium	105	80	76%	0.001 - 0.083
Cobalt	105	11	10%	0.011 - 0.025
Copper	105	80	76%	0.001 - 0.120
Lead	105	56	53%	0.001 - 0.370
Mercury	105	7	7%	0.0002 - 0.0015
Molybdenum	105	7	7%	0.020 - 0.087
Nickel	105	105	100%	0.0014 - 0.250
Selenium	105	11	10%	0.0022 - 0.0094
Silver	105	1	1%	0.0013
Thallium	105	0	0%	--
Vanadium	105	17	16%	0.010 - 0.069
Zinc	105	23	22%	0.020 - 0.700

Notes:

mg/L = milligrams per liter

- a. Duplicate samples were not counted as additional samples. For the duplicate samples, a detection in either the primary or duplicate sample was called a detection. The higher of the two results is reported in the range.
- b. Number of detections as a percent of the total number of samples.

Sources:

ENVIRON, Results of Investigation Mission Bay North of Channel, San Francisco, California, February 1997, Table 14.

ENVIRON, Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California, February 1998, Table 4-10.

Esprit investigations were considered in the evaluation of the Project Area. Results of the investigation of the Castle Metals site were considered and separately reported in the SEIR text in Section V.J, Contaminated Soils and Groundwater. Soil and groundwater samples were collected from a total of 111 borings and temporary monitoring wells as shown in Figure V.J.4. Two soil samples from each boring, ranging in depth from 0.5 to 8 feet below the ground surface, were collected and analyzed. All soil samples were analyzed for VOCs, pesticides and PCBs, TPH-gasoline, -diesel and -motor oil fractions, metals, and asbestos. Shallow soil samples were not tested for VOCs because volatile compounds do not tend to persist in surface soils. Groundwater from each soil boring that was converted into a temporary monitoring well approximately 15 feet deep or collected from a Hydropunch™ boring was tested for VOCs, SVOCs, metals, TPH, and pH. The metals sampling program included antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

Mission Bay South Soil Results

Results of soil sampling in Mission Bay South are summarized in Tables I.4 through I.10. Each table lists the chemical detected, the range of concentrations, and the number of detections of each chemical compared to the number of total samples. In addition, Figures V.J.5 through V.J.8 show the locations of soil borings where some of these chemicals were detected and the concentrations of these chemicals. A narrative summary of this information is provided below.

Volatile Organic Compounds

Volatile organic compounds (VOCs) were detected in nearly one-half of the soil borings in Mission Bay South (see Figure V.J.5). Most of the soils containing VOCs are generally located close to former USTs or to the former bulk petroleum storage, pipelines, and transfer facilities previously located in the southeast portion of the Mission Bay South area (UST locations are shown in Figure V.J.2, petroleum facilities in Figure V.J.3). Sixteen VOC compounds were detected in the samples collected. As shown on Table I.4, among the VOCs detected most frequently were acetone, 2-butanone, carbon disulfide, methylene chloride, benzene, toluene, ethylbenzene, and xylenes (the last four are collectively referred to as “BTEX” compounds).

Concentrations of BTEX compounds were more elevated in one boring (MW-C8, located northeast of the intersection of Illinois Street and 16th Street in the former bulk oil storage area) than at other locations. BTEX concentrations ranged from 270 to 8000 µg/kg. Other borings south of MW-C8 and a few near the northern end of Illinois Street also contained elevated concentrations of BTEX compounds; however, the concentrations were much lower than in MW-C8 (generally less than 100

μg/kg). Acetone and methylene chloride (to a lesser degree) were reported in samples collected from approximately one-half of the borings in which VOCs were detected. Acetone and methylene chloride are both chemicals used in analytical laboratory processes. As described for Mission Bay North above, it is possible that some of these results may be from the laboratory analyses, rather than actual detections in soil./5/

Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs) were detected in 16 borings in Mission Bay South. All but one of the SVOCs detected were PAHs, which are typically associated with heavy-end fuels (such as oils) and the combustion of organic material (such as coal and gas), and are commonly found at former industrial sites. The SVOC detected in soil was dibenzofuran, found in one soil sample at a concentration of 2,000 μg/kg, as indicated in Table I.5. As shown in Figure V.J.7, there were several PAH detections in borings in the vicinity of Third and Illinois Streets near Fourth Street (SF19, MW-C2, C21, SF23, MW-C12, MW-C41 boring locations also shown in Figure V.J.4). Other locations where PAHs were detected included: three borings on the UCSF site near Sixth Street (UC29, UC30, UC31); three borings between 16th Street and Mariposa Street (C25, MW-C6, and SF24), and scattered locations in the vicinity of the western part of China Basin Channel and west of Owens Street (SF12 and C23) and north of the UCSF site (C13 and SF21).

As shown in Table I.6, PAHs detected most frequently included: benzo(g,h,i)perylene, fluoroanthene, phenanthrene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoroanthene, chrysene. Other PAHs detected at lesser frequency included 2-methylnaphthalene, acenaphthene, acenaphthalene, anthracene, fluorene, naphthalene, dibenz[ah]anthracene, and indeno[1,2,3-cd]pyrene. Concentration ranges for each SVOC detected are also shown in Tables I.5 and I.6. For those SVOCs detected more frequently, the locations with the greatest number of contaminants detected and highest concentrations included: MW-C41 (benzo(g,h,i)perylene, phenanthrene, pyrene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoroanthene, chrysene, and others) in the former port area around Illinois and 16th Streets, and SF19 (contaminants similar to MW-C41) south of the intersection of Channel Street and Third Street.

Although PAHs were detected at various locations throughout Mission Bay South, the frequency of detections ranged from less than 1% to 7%. Based on the low frequency of detections, it appears that there is no pattern associated with the PAH detections, which indicates there is no specific identifiable source of PAHs in the soil in Mission Bay South.

Total Petroleum Hydrocarbons

Of the 205 soil samples taken from 105 borings, diesel and motor oil fractions of total petroleum hydrocarbons (TPH) were detected in about 25% and 60% of the samples analyzed, respectively. Relatively few (6%) of the soil samples contained detectable levels of TPH-gasoline (see Table I.7).

The maximum concentrations of TPH-diesel and TPH-gasoline were detected in samples from boring C36 (north of 16th Street just east of Illinois Street) at a depth of 6.5 feet below ground surface. Maximum concentrations for TPH-gasoline and TPH-diesel in soil were found to be 490 mg/kg and 12,000 mg/kg, respectively. TPH-motor oil was detected at a maximum concentration of 4,300 mg/kg at a depth of 3.0 feet from boring SF21 (about 400 feet east of Sixth Street, and 700 feet south of Channel Street).

Pesticides and PCBs

Organochlorine pesticides aldrin, dieldrin, endosulfan I, lindane, heptachlor, and heptachlor epoxide were detected in one soil boring on the UCSF site approximately 200 feet east of Third Street (location UC-12, Figure V.J.8). Concentrations ranged from 120 to 160 $\mu\text{g}/\text{mg}$. Endrin and heptachlor epoxide were detected in soil in another boring approximately 800 feet north of 16th Street, also on the UCSF site (location UC-11 in Figure V.J.8). Concentrations ranged from 12 to 31 $\mu\text{g}/\text{mg}$. Pesticides were not detected in any other soil sample collected from Mission Bay South. PCBs were not detected in any soil sample in Mission Bay South.

Metals

All 18 metals tested for were detected in soil borings in Mission Bay South (see Table I.9). Arsenic, barium, beryllium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc were detected most frequently (i.e., in more than 50% of the samples). Concentrations of most of these metals ranged from trace amounts (less than a few mg/kg) to higher values (upwards of 100 mg/kg). The geographic distribution of all metals detected suggests that the concentrations are likely representative of background conditions for Mission Bay fill materials and that there is no single, isolated source of metals in Mission Bay South soils.

Of all the metals detected, lead showed the greatest range in concentrations. The maximum concentration of lead detected was 47,900 mg/kg at one boring location (C18) at a depth of 2.5 feet below the ground surface, northwest of the Third and Fourth Streets intersection. At other locations, lead levels in soil in Mission Bay South generally ranged from 18 to 4,260 mg/kg.

Asbestos

Asbestos was detected in 38 soil borings in Mission Bay South. The detections are believed to be attributable to the construction debris and fill placed in Mission Bay South and are randomly distributed throughout the Project Area. Trace amounts (less than 1% concentration) were found in nearly two-thirds of the locations sampled (see Table I.10). Chrysotile asbestos (the friable form of which is subject to regulation) was found in the other locations, ranging in concentration from 1% to 75%. Serpentine is one of several rock types surrounding and underlying the Project Area; and some of the material was used to fill Mission Bay. Consequently, the presence of chrysotile asbestos in soil from naturally occurring chrysotile fibers in serpentinite fill material is not unexpected. Two borings, MW-SF10 (west of Terry A. François Boulevard in Assessor's Block 3852, lot 2) and UC24 (east of Owens Street in Assessor's Block 3835, lot 3), had soil asbestos concentrations exceeding 65%.

Mission Bay South Groundwater Results

Results of groundwater sampling performed in Mission Bay South are summarized in Tables I.11 through I.15. Each table lists the chemical detected, the range of concentrations, and the number of detections of each chemical compared to the number of total samples. In addition, Figures V.J.6, and V.J.9 through V.J.13 show the locations of monitoring wells where chemicals were detected and the concentrations of the chemical. A summary of this information is provided below.

Volatile organic compounds, semivolatile organic compounds, PAHs, metals, and total petroleum hydrocarbons in gasoline, diesel, and motor oil fractions were detected in Mission Bay South groundwater samples. In addition, petroleum free product with a measurable thickness was found floating on top of the groundwater in an area east of Illinois and 16th Streets.

Volatile Organic Compounds

A total of 16 volatile organic compounds (VOCs) were detected in 21 groundwater samples collected during the Mission Bay South investigation. As Table I.11 shows, concentrations ranged from a low of 1.0 $\mu\text{g/L}$ for concentrations of such chemicals as chloroform and toluene to a high of 240 $\mu\text{g/L}$ for benzene. The frequency of detection for these 16 compounds ranged from 1% for perchloroethylene and other compounds to 9% for benzene. Detections of VOCs occur throughout Mission Bay South, but tend to be concentrated near the former bulk petroleum storage, pipelines, and transfer facilities previously located near the area east of Illinois Street on the port property. Figure V.J.9 shows the locations of VOCs detected in groundwater sampling locations in Mission Bay South.

Aside from the VOCs associated with petroleum contamination, most of the other VOCs were detected in one monitoring well (MW-C4), located south of 16th and east of Seventh Streets. A number of other chlorinated hydrocarbons were detected in MW-C4, including, but not limited to, TCE; 1,1-dichloroethane; cis-(1,2)-dichloroethane; and vinyl chloride. As shown in Table I.11, these chemicals comprise a small percentage of all VOCs detected.

Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs), were detected in groundwater samples; the frequency of detection of these compounds was low and ranged from 1% to 3%. Five SVOCs were reported in groundwater samples from two locations during the investigation, one west of Third Street between Fourth and 16th Streets (boring UC12) and the other between Seventh and Owens Streets south of Channel Street (boring C22), as shown in Figure V.J.6. The SVOCs in boring UC12 included phenol, 2-4 methylphenol, 2-methylphenol, and 4-methylphenol. Bis(2-ethylhexyl)phthalate (DEHP), a common laboratory contaminant was detected in water sampled from groundwater in boring C22. With a concentration of 31 $\mu\text{g/L}$, and no other detections at any of the sampling locations, it is unlikely that there is a source of DEHP on site. SVOCs other than PAHs were detected in approximately 1% of the samples analyzed. Table I.12 lists the concentrations of SVOCs detected.

Six groundwater samples show detectable concentrations of PAHs (see Figure V.J.10). Two are just west of Terry A. François Boulevard, near the oil facilities (MW-SF35 and SF27), two are north of Mariposa Street just west of the proposed extension of Fourth Street (C27 and SF25), and two are west of Third Street north of 16th Street (UC7 and UC12). Six types of PAHs were detected, including benzo[b]fluoranthene, a cancer-causing PAH which was detected in one sample collected from SF27 at a concentration of 22 $\mu\text{g/L}$.

The pattern of detections and concentrations of SVOCs in Mission Bay South groundwater indicates that there are no specific identifiable sources of contamination in the Project Area that could be attributed to the presence of these chemicals in Mission Bay South groundwater.

Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPH) in the diesel, gasoline, and motor oil fractions were detected in groundwater samples obtained during the Mission Bay South investigations. TPH-diesel was detected in 38% of the samples (see Table I.14). TPH-gasoline and TPH-motor oil were detected at frequencies of 16% and 29%, respectively.

Most of the TPH gasoline detections were located on or near Assessor's Block 3892, lot 1, near former petroleum bulk storage, pipelines and transfer facilities (see Figure V.J.3 for locations of bulk storage facilities, and Figure I.1 for a map showing Assessor's Blocks and lots). Three groundwater samples from this area showed concentrations of TPH-gasoline greater than 1.0 mg/L. The maximum concentration of 36 mg/L was detected in boring C35 located about 100 feet north of 16th Street just east of Illinois Street (see Figure V.J.11).

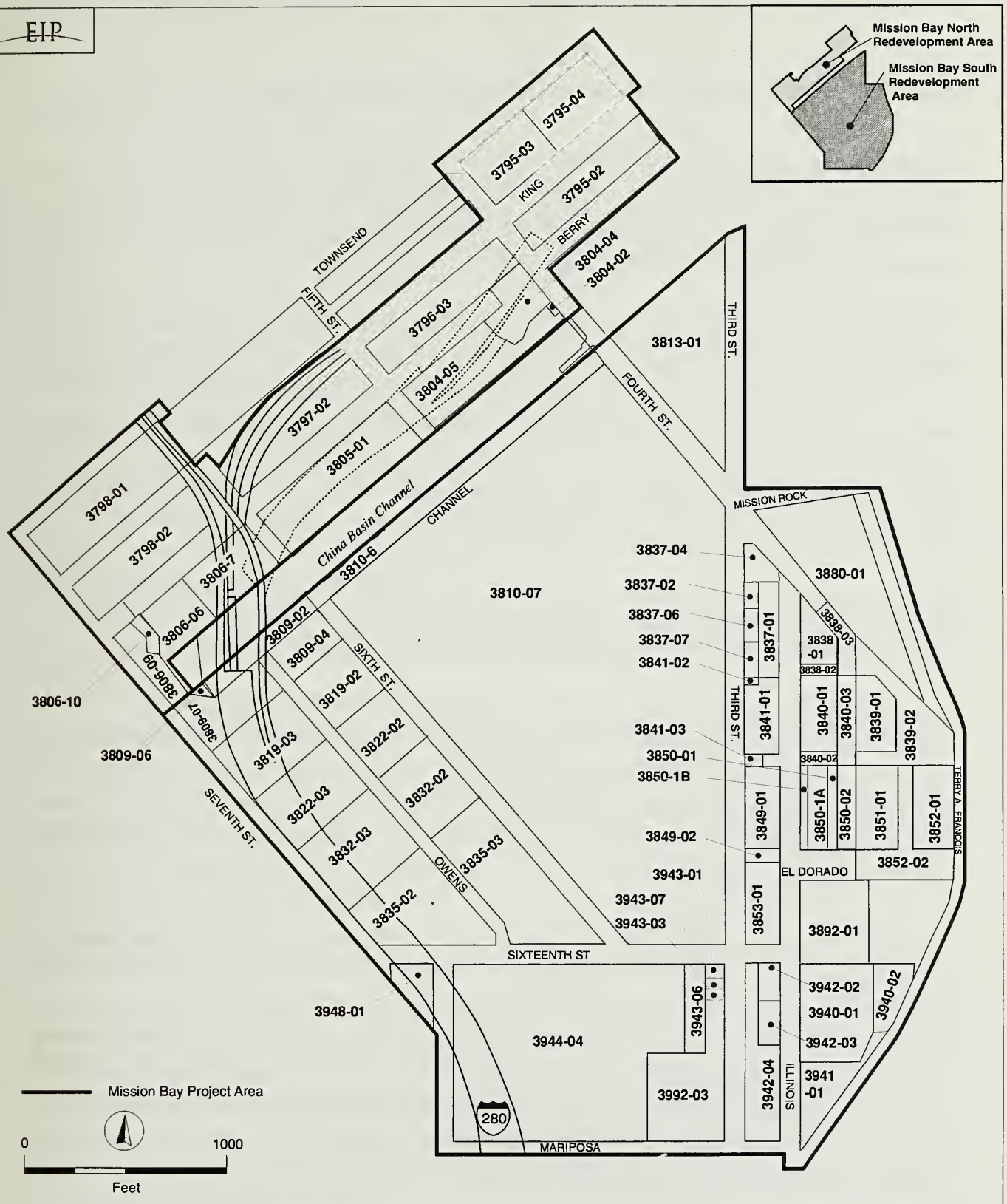
Detections of TPH-diesel in groundwater were scattered through the investigation area. Most of the higher concentrations (greater than 10 mg/L) were detected in the former petroleum bulk storage, pipelines, and transfer facilities. The highest concentration of 330 mg/L was detected in boring UC10, about 400 feet north of 16th Street west of Third Street (see Figure V.J.12).

As with TPH-diesel, detections of TPH-motor oil in groundwater were scattered throughout Mission Bay South (see Figure V.J.13). Most concentrations of TPH-motor oil were less than 1.0 mg/L with the exception of samples from the center of Mission Bay South (MW-UC1, UC11, UC12, and UC26) and three samples collected from east of Illinois Street (MW-C12, MW-SF6, and MW-SF8). The maximum concentration of TPH-motor oil (4.7 mg/L) was observed in MW-C12 east of Illinois Street, adjacent to the former USTs.

Petroleum Free Product

As discussed previously, based on observations made during drilling and sampling activities, a petroleum free product area was identified in the southeast portion of Mission Bay South. The approximate horizontal extent of free product with a measurable thickness greater than 0.01 inch is shown in Figure V.J.14. A free product thickness of 1.6 feet was measured by ENVIRON in monitoring well MW-C9, about 300 feet east of Illinois Street approximately in line with the extension of 16th Street (near the pipelines shown in 16th Street in Figure V.J.3).

Chemical analysis indicates that the free product is most likely weathered crude oil that had undergone moderate biodegradation. Some volatile (lighter end) hydrocarbons were also present in the free product. The chemical characteristics of the weathered crude oil are believed to be consistent with a release that may have occurred over 10 years ago. The presence of free product is likely related to the former petroleum bulk storage, pipelines and transfer facilities previously located on Assessor's Block 3892, lot 1 and on the Esprit property near the 16th and Illinois Streets intersection (Assessor's Block 3940), as well as the underground petroleum pipelines used by these facilities that run beneath 16th Street to Pier 64. These facilities, which handled products such as diesel, kerosene, gasoline, lubricating oil, crude oil, and bunker fuel oil, were active from the early 1900's to the 1960's and early 1970's.



SOURCE: EIP Associates, San Francisco Department of City Planning

MISSION BAY SUBSEQUENT EIR

● **FIGURE I.1 ASSESSOR'S BLOCKS AND LOTS COMPRISING THE PROJECT AREA**

Metals

All metals except beryllium and thallium were detected in groundwater in Mission Bay South. Arsenic, barium, chromium, copper, lead, and nickel were detected most frequently and at low concentrations, as shown in Table I.15. Lead was detected in approximately one-half of the samples, ranging in concentration from 0.001 to 0.370 mg/L.

A statistical analysis of upgradient versus down gradient concentrations of metals indicated that arsenic, barium, chromium, copper, lead, mercury, and nickel are not substantially higher down gradient than upgradient. This suggests that there is no significant detectable contribution of these metals from a major source area within Mission Bay South and no net gain of these dissolved metals as groundwater migrates under the Project Area. Thus, the source of metals detections in groundwater appears to be related to the fill materials placed in Mission Bay South rather than releases from specific identifiable sources such as industrial waste disposal or releases.

METHODOLOGY FOR EVALUATING EXISTING HUMAN HEALTH AND ECOLOGICAL RISKS DUE TO CONTAMINANTS DETECTED IN SOIL AND GROUNDWATER IN THE PROJECT AREA PRIOR TO CONSTRUCTION

The Project Area is located in a predominantly industrial and commercial area and is in proximity to off-site residential areas. Current uses include trucking and storage facilities, import and trading companies, automobile, bus and truck maintenance facilities, golf driving range, retail outlets, sand/gravel and cement operations, parking areas and vacant space. Businesses adjacent to the area include railroad facilities, light industrial, warehouse and storage facilities, retail outlets, office space, restaurants, and residences.

An analysis of existing conditions in the Project Area that could potentially impact human health and/or the ecological environment was prepared by ENVIRON International Corporation in February 1998. The results were presented in *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area* and *Technical Memorandum #2, Development and Screening of Remedial Alternatives for Free Product Area in Region of Former Oil Storage Facilities*, and *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*.^{16/} Unless otherwise noted, the following discussion of the methods that were used to evaluate potential human and ecological effects under existing conditions is summarized from information provided in those documents.

Analysis of Potential Immediate Adverse Human Health Effects Associated with Current Conditions in the Project Area

The agencies responsible for overseeing site remediation have not developed specific risk assessment guidelines to identify sites that require an immediate response. To determine the need for immediate control measures in the absence of specific regulatory criteria, ENVIRON developed a tiered approach, which is presented in *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*. The process consisted of identifying chemicals of potential immediate concern (COPIC), identifying the levels of COPIC to which individuals could potentially be exposed, and then evaluating the potential for the levels of COPIC to which individuals may actually be exposed to represent a potential human health threat sufficient to warrant the implementation of immediate risk management measures. The evaluation of the potential human health impacts was based on the potential for short-term exposure to the COPIC present in the Project Area to cause cancer, noncancer, or acute health effects in the potentially exposed populations. The tiered approach consisted of the following two steps—identification of COPIC and the analysis of COPIC, which are summarized below.

Identification of COPIC: Comparison of Maximum Concentrations to U.S. EPA Region IX Industrial PRGs

Current populations in the Project Area could be directly exposed to chemicals present in the soils if direct contact with the soils were to occur. In order to identify which of these chemicals could potentially pose a risk to populations exposed in the short-term interval between the present and when the RMP is approved and implemented, the maximum concentrations of all chemicals detected in the soil anywhere in the Project Area in greater than 1% of the samples (i.e., in two or more samples) were compared to Region IX Industrial PRGs. The use of the Region IX Industrial PRGs as the initial point of comparison was considered a conservative screening approach, since the Region IX Industrial PRGs represent soil concentrations that are considered protective of long-term exposure scenarios. These scenarios assume exposure occurs via the inhalation of particulates, soil ingestion, and dermal contact pathway for an extended 25-year exposure scenario. Although used as initial screening criteria to identify COPICs, the Industrial PRGs are not appropriate criteria for evaluating post-development conditions, since when development is complete the existing soil would be completely capped by buildings, streets, sidewalks and landscaping. Given the limited time period between now and when the RMP would be submitted and approved, and the fact that the current land uses in the Project Area are industrial, not residential, the use of the Region IX Industrial PRGs as initial screening criteria to identify chemicals that could pose potential health impacts based on short-term exposures is conservative; chemicals with maximum detected concentrations below the Region IX Industrial PRGs would not likely represent an immediate health concern. The assumed total

25-year exposure in the development of the Region IX Industrial PRGs is likely to be significantly greater than the actual exposures that may occur in the short-term interval between now and when the RMP is developed and approved, which is likely to be no more than six months.

The comparison of the maximum concentrations of the volatiles, metals, PAHs, and TPH detected in soil samples collected in the Project Area to the risk-based Region IX Industrial PRGs is presented in Table I.16. The lower of either the carcinogenic PRG (protective of carcinogenic effects) or the noncarcinogenic PRG (protective of noncarcinogenic effects) was used, when both were available. Since U.S. EPA has not developed PRGs for the ranges of TPH, the criteria presented for TPH are the site-specific target levels (SSTLs) developed by ENVIRON in 1996 for on-site Project Area residents. These SSTLs are used as an initial point of comparison because they have been approved by the RWQCB for use at underground storage tank (UST) sites in Mission Bay. The use of residential SSTLs is considered conservative when applied to current industrial/commercial populations because they assume long-term exposures via the inhalation, ingestion and dermal contact pathways.

As shown in Table I.16, the maximum concentrations of arsenic, beryllium, lead, and various carcinogenic PAHs exceed the Region IX Industrial PRGs. Based on a comparison of the maximum detected concentrations to the Region IX Industrial PRGs, the chemicals that warrant further evaluation, and that were, therefore, identified as COPIC for the purposes of current conditions, include arsenic, beryllium, lead, and carcinogenic PAHs. The other chemicals detected in the soils across the Project Area were not detected at levels that would potentially warrant an immediate response. This includes the levels of TPH detected in the soils around the petroleum free product area.

Analysis of COPIC

Comparison of Concentrations in Exposed Soils to Region IX Industrial PRGs

As described above, the COPIC selected for additional evaluation include arsenic, beryllium, lead, and the carcinogenic PAHs. The purpose of the second tier of this evaluation was to determine whether the concentrations of the COPIC to which individuals could be exposed in the short-term interval would likely result in any long-term carcinogenic or noncarcinogenic adverse health impacts. This was accomplished by identifying the concentrations to which the current populations may actually be exposed, referred to by U.S. EPA as the reasonable maximum exposure concentrations, and then comparing the potential reasonable maximum exposure concentrations to Region IX Industrial PRGs. Because the potential for chemicals to cause cancer is a function of the cumulative

TABLE I.16
MAXIMUM SOIL CONCENTRATIONS IN ALL SOIL SAMPLES,
MISSION BAY PROJECT AREA

Chemical	Maximum Soil Concentration (mg/kg)	Risk-Based USEPA Region IX Industrial PRG /a/ (mg/kg)
<i>Volatiles</i>		
Freon 113	0.0082	5600
Freon 11	0.005	1273
2-Butanone	0.12	27000
2-Hexanone	0.016	/b/
Acetone	0.77	8754
Benzene	0.27	1.4
Carbon Disulfide	0.043	24.5
Chloroform	0.0062	0.53
Ethylbenzene	2.7	230
Methylene Chloride	0.11	17.8
Styrene	0.051	680
PCE	0.011	16.7
Toluene	4.3	880
TCE	0.11	7
m & p-Xylenes	8	320
o-Xylene	4.9	320
<i>Polycyclic Aromatic Hydrocarbons (PAHs) Noncarcinogenic PAHs</i>		
Acenaphthene	2.9	11000 /c/
Acenaphthylene	2.1	
Anthracene	6.9	160000 /c/
Benzo(ghi)perylene	2.6	
Fluoranthene	17	27251 /c/
Fluorene	2.9	18000 /c/
Naphthalene	2.4	4400 /c/
Phenanthrene	17	
Pyrene	20	20000 /c/

(Continued)

TABLE I.16 (Continued)

Chemical	Maximum Soil Concentration (mg/kg)	Risk-Based USEPA Region IX Industrial PRG /a/ (mg/kg)
Sum of Noncarcionogenic PAHs	74.1	
<i>Carcinogenic PAHs</i>		
Benz[a]anthracene	11	2.6
Benzo[a]pyrene	8.7	0.26
Benzo[b]fluoranthene	9.6	2.6
Benzo[k]fluoranthene	7.7	26
Chrysene	9.9	7.2
Dibenz[ah]anthracene	0.46	0.26
Indeno[1,2,3-cd]pyrene	3.2	2.6
Sum of Carcinogenic PAHs /d/	12.1054	
<i>Metals</i>		
Antimony	325	680
Arsenic	247	2.4
Barium	5250	10,000
Beryllium	4.7	1.1
Cadmium	15.2	850
Chromium	1710	/e/
Chromium, hexavalent	4.4	64
Cobalt	119	97,000
Copper	3520	63,000
Lead	47900	1,000
Mercury	32.7	68
Molybdenum	8.6	8,500
Nickel	2650	34,000
Selenium	3	8,500
Silver	4.6	8,500
Thallium	3.1	140
Vanadium	218	12,000
Zinc	6500	100,000

(Continued)

TABLE I.16 (Continued)

Chemical	Maximum Soil Concentration (mg/kg)	Risk-Based USEPA Region IX Industrial PRG /a/ (mg/kg)
<i>Petroleum Hydrocarbons</i>		
TPH-Gasoline	490	1230 /f/
TPH-Diesel	12000	23000 /f/
TPH-Residual	4300	210000 /f/

Notes:

mg/kg = milligrams per kilogram

- a. From *Region IX Preliminary Remediation Goals* (USEPA August 1, 1996). A blank in this column indicates that no Region IX PRG exists.
- b. Region IX has not developed a PRG for this compound. However, since 2-hexanone is a volatile compound, but is significantly less toxic than benzene, we would not expect the 2-hexanone to be selected as a COPIC.
- c. These Region IX PRGs correspond to the risk-based levels, obtained on-line from USEPA's PRG table (<http://www.epa.gov/region9/>). Also noted in the USEPA 1996 PRG table for these compounds are PRGs based on the soil saturation equation ("sat"). Since the soil saturation limit has no relevance to the potential for adverse health effects, the risk-based PRGs are used in preference over the soil saturation limit.
- d. Carcinogenic PAHs are reported as benzo[a]pyrene-equivalents, using the potency-equivalency factors recommended by Cal/EPA (Cal/EPA 1993).
- e. Although an industrial PRG of 450 mg/kg is presented for total chromium, this number is based on the potential for carcinogenic effects associated with hexavalent chromium, with an assumed hexavalent to trivalent chromium ratio of 1 to 6. Since the soil samples were speciated for hexavalent chromium, the hexavalent chromium data is compared directly to the hexavalent chromium PRG of 64 mg/kg; the PRG of 450 mg/kg is not relevant when site data present information on the presence of hexavalent form of chromium.
- f. Site-Specific Target Levels developed for on-site residents, presented in *Risk Management Plans, Six Former Underground Storage Tank Sites in the Mission Bay Site* (ENVIRON 1996).

Source: ENVIRON International Corporation, *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, April 1998, Table 4-1.

lifetime dose, the Industrial PRGs for carcinogenic compounds have been adjusted to account for the limited six-month exposure period. Noncarcinogenic effects, however, can appear over a relatively short time period. Because noncarcinogenic effects can appear over a relatively short time period, and because the potential for noncancer effects is a function of an individual's annual average daily dose (as opposed to a cumulative dose), Region IX Industrial PRGs developed to protect from the onset of noncarcinogenic effects have not been adjusted to account for the limited six-month exposure period.

Consistent with U.S. EPA risk assessment guidance, the reasonable maximum exposure to which individuals could be exposed was determined by calculating the 95% UCL of the arithmetic mean concentration that is contacted over the exposure period. For the evaluation of potential carcinogenic and noncarcinogenic impacts associated with short-term exposures, the reasonable maximum concentration to which individuals could be exposed was estimated by calculating the 95% UCL of the arithmetic mean concentration of the COPIC detected in the exposed soils. This was accomplished by identifying all areas in both the North of Channel and the South of Channel where soils are currently exposed (i.e., not covered by asphalt, concrete, or structures). Exposed soils were identified by examining the boring logs prepared during the soil investigation programs. In addition, aerial photos and visual corroboration from a site walk-through were used. Fifty-seven of the 125 sampling locations in the 303-acre Project Area coincide with areas where exposed soils currently exist. Based on the overall objectives of the sampling program and the methods that were used in selecting the location and density of the samples, the 57 samples collected from the surface soils are sufficient to provide an estimate of the types of exposures that individuals could incur in the short term between now and when the RMP is approved and implemented.

Table I.17 presents the range of concentrations of the arsenic, beryllium, lead, and carcinogenic PAHs detected in the exposed soils, and the estimated 95% UCL of the arithmetic mean concentration in the exposed soils. The concentrations in the soils to which individuals could be exposed correspond to the concentrations detected in the shallowest sample (generally collected from between 0.5 and 1.5 feet below ground surface) collected from each of the 57 borings which were advanced in areas of exposed soils. Also presented in Table I.17 are the Region IX Industrial PRGs. As shown, the Industrial PRGs developed for the protection of cancer have been multiplied by 50, since the exposures that could occur in the immediate short-term six month interval are approximately one-fiftieth of the long-term exposure assumed in the Region IX Industrial PRGs (i.e., 0.5 year/25 years).

As indicated by the data, both the average and 95% UCL concentrations for arsenic, beryllium, lead, and the carcinogenic PAHs are all significantly below both the carcinogenic Region IX Industrial PRGs, adjusted to account for a limited short-term exposure, and the noncarcinogenic Region IX Industrial PRGs. Thus, short-term exposures to the levels of chemicals present across the Project Area would not result in adverse health impacts (either carcinogenic or noncarcinogenic) in individuals potentially exposed to the COPIC in the exposed soils.

TABLE I.17
RANGE OF METALS AND PAHs DETECTED IN EXPOSED SURFACE SOILS: COMPARISON TO USEPA REGION IX PRGs

Compound	Number of Samples	Number of Detections	Detection Frequency (%)	Exposed Soils/a/			USEPA Region IX Industrial PRG-Carcinogenic Effects: Adjusted for 6-Month Exposure (mg/kg)/c/		USEPA Region IX Industrial PRG Noncancer Effects (mg/kg)
				Range (mg/kg)	Average (mg/kg)/b/	95% UCL (mg/kg)/b/			
Arsenic	55	52	95%	ND-247	20	30	120	380	
Beryllium	55	30	55%	ND-0.67	0.22	0.24	55	8,500	
Lead	55	53	96%	ND-1,780	250	333	1,000/d/	1,000	
PAHs-Carcinogenic/e/	55	5	9%	ND-1.8	1.8	2.8	13	4,400 /f/	

Notes:

mg/kg = milligrams per kilogram

ND = Not detected.

PRG = Preliminary Remediation Goals

95% UCL = 95% Upper Confidence Limit (UCL) of the arithmetic mean.

a. Corresponds to the shallowest samples collected from any exposed soils (i.e., areas not covered by asphalt, concrete, or structures).

All borings considered to represent exposed soils are identified in the Project Area.

b. Consistent with U.S. EPA *Risk Assessment Guidance for Superfund* (RAGS), if the 95% UCL of the arithmetic mean is greater than the maximum detected concentration, then the maximum detected concentration is the level that should be used in estimating human exposures.

c. Corresponds to the Region IX Industrial PRG adjusted to account for the fact that the immediate exposure (prior to implementation of the Risk Management Plan) is expected to occur for approximately 6 months. Because the Industrial PRGs for carcinogenic effects assume a 25-year exposure period, the Industrial PRGs for carcinogenic effects were multiplied by 50.

d. Industrial PRG for lead is not based on carcinogenic effects. Thus, adjustment for 6-month exposure is not appropriate.

e. Represents the sum of all carcinogenic PAHs, converted to Benzo(a)pyrene-equivalents, using the potency equivalency factors recommended by Cal/EPA.

f. Corresponds to the risk-based US EPA Region IX PRG for naphthalene. Naphthalene, which is the lowest of the noncarcinogenic PAH values, is the most appropriate surrogate for noncarcinogenic toxicity of all PAHs.

Source: ENVIRON International Corporation, *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, April 1998, Table 4-3.

Comparison of Concentrations in Exposed Soils to Acute Thresholds Developed and Used at Other Sites in California

Chemicals detected in on-site exposed surface soils do not present an acute health threat (defined as due to one visit to a location, or as repeated daily visits over a period of two weeks) to children who could be exposed under short-term, high-exposure conditions. This determination was based on a comparison of the maximum concentrations of the COPIC to acute thresholds for chemical constituents developed to be protective of child populations (0-6 years).⁷⁷ The methods used to calculate acute thresholds have been used and approved by the DTSC at other sites as immediate action levels, and were developed to be protective of short-term exposures to surface soil in a residential setting. Because children often have much greater soil ingestion rates than adults, particularly in relation to their smaller body weight, children are at a greater risk than adults from acute exposures to chemicals in soil. Thus, the acute thresholds were developed assuming that the exposed individual is a child. Acute thresholds developed to be protective of children would simultaneously be protective of adults.

Acute thresholds developed for arsenic, beryllium, lead, and PAHs are presented in Table I.18. As shown, the acute thresholds for arsenic, beryllium, lead, and PAHs are 525 mg/kg, 940 mg/kg, 3125 mg/kg, and 994 mg/kg, respectively. As indicated on Table I.18, even the maximum concentrations of arsenic, beryllium, lead, and PAHs in the exposed soils are all below the acute threshold levels.

Analysis of Potential Adverse Ecological Effects Associated with Current Conditions in the Project Area

As previously described, chemicals present in the soils could potentially impact the health of the ecological environment if terrestrial or nesting avian species come into direct contact with soils which contain elevated levels of chemicals, or if the chemicals in exposed soil were to be released into China Basin Channel or San Francisco Bay through surface water runoff. Additionally, chemicals present in the soil and groundwater could potentially impact the aquatic environment if the chemicals leach from the soil into the groundwater and subsequently migrate to China Basin Channel or San Francisco Bay.

As discussed in the 1990 Mission Bay Final Environmental Impact Report (FEIR), the current and future conditions within the Project Area do not provide a habitat capable of supporting a significant terrestrial or nesting avian wildlife community. Accordingly, potential exposures that terrestrial species could have with soils would not represent a significant effect on the terrestrial wildlife community.

TABLE I.18
COMPARISON OF CONCENTRATIONS IN EXPOSED SOILS TO ACUTE THRESHOLDS

Compound	Exposed Soils		Acute Threshold/a/ (mg/kg)
	Range (mg/kg)	95% UCL (mg/kg)	
Arsenic	ND-247	30	525
Beryllium	ND 0.67	0.24	940/b/
Lead	ND-1780	333	3125
PAHs-Total/c/	ND-19	26	994

Notes:

mg/kg = milligrams per kilogram

ND = Not detected

95% UCL = 95% upper confidence limit of the arithmetic mean.

- a. Acute thresholds developed and applied at other sites in California.
- b. Using an approach developed by ENVIRON in 1995, and the assumption that the acute toxicity of beryllium is approximately 10 times greater than the chronic toxicity of beryllium (where the chronic toxicity of beryllium is represented by the U.S. EPA chronic Reference Dose of 0.005 mg/kg-day), an acute threshold of 940 mg/kg was developed for this evaluation.
- c. Represents the sum of all carcinogenic and noncarcinogenic PAHs. Since the acute threshold was developed to protect against short-term noncarcinogenic effects of the PAHs, all PAHs (carcinogenic and noncarcinogenic combined) were evaluated for their potential to cause acute health effects.

Source: ENVIRON International Corporation, *Technical Memorandum #1, Approach to a Plan for Risk Management*, Mission Bay Project Area, April 1998, Table 4-4.

A screening-level evaluation of the potential impact that the existing soils and groundwater conditions could have on the aquatic environment through the potential leaching of chemicals from the soils, into the groundwater, and the subsequent migration of the groundwater to the nearby China Basin Channel and San Francisco Bay was conducted by ENVIRON was presented in the 1998 Mission Bay South report.^{18/} The potential for chemicals to leach from the soil into groundwater, including leaching that may have occurred after storms, is reflected in the levels of constituents measured in groundwater. Thus, results of groundwater sampling and analyses provide a basis for estimating the potential impacts on the aquatic environment.

Methodology

The potential for chemicals detected in groundwater in the Project Area to pose a risk to aquatic organisms in adjacent water bodies was evaluated by identifying classes of chemicals of potential ecological concern (COPEC), evaluating the potential for those chemicals to migrate to surface water bodies, and determining whether those chemicals could be released in concentrations sufficient to pose a potential risk to the aquatic organisms. Results of these evaluations were presented in *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel* and *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, prepared by ENVIRON in 1998.

Identification of COPECs

The COPECs were identified by examining the frequency of detection of the chemicals in groundwater, assessing the location of detections relative to the surface water bodies, and examining the soil and groundwater data to evaluate whether significant source areas existed for the detected chemicals. The frequency of detection was an important consideration in a screening-level evaluation because many of the chemicals detected in the Project Area were detected in a small percentage of the samples. As noted by ENVIRON, results of U.S. EPA studies indicate that infrequently detected chemicals may be artifacts in the data and, therefore, may be unrelated to past operations or disposal practices. In such cases, U.S. EPA recommends that such chemicals could be eliminated from further consideration in the risk assessment. Five percent is a commonly used guideline when detection frequency is used as a criterion for determining whether a chemical is likely to be an artifact and should be excluded from the quantitative risk assessment. Another important aspect of the evaluation was whether a reported detection, however infrequent, would represent a significant risk if the detection actually represented the presence of a chemical. To address this uncertainty, U.S. EPA in their *Risk Assessment Guidance for Superfund* (RAGS) establishes that fate and transport considerations and modeling can be used to determine if infrequently detected chemicals should be excluded from further evaluation in the risk assessment.

Using the methodology described above, naphthalene, certain VOCs, metals, and petroleum hydrocarbons were identified as COPECs.

Evaluation of Potential Ecological Risks

The ecological risk evaluation included examining the frequency of detections of COPECs in groundwater in conjunction with the proximity of the detected constituents relative to nearby surface

water bodies, comparing the concentrations of the detected chemicals to marine water quality standards applicable to San Francisco Bay, and estimating and modeling the attenuation of groundwater concentrations as they flow toward China Basin Channel and San Francisco Bay.

As noted by ENVIRON, no criteria have been developed for the assessment of risk to ecological receptors in the aquatic environment based on comparisons to groundwater chemical concentrations. However, ambient water quality criteria for the protection of marine (saltwater) organisms are used as a conservative means of evaluating the potential risk to surface water organisms. Aquatic criteria used for comparisons in the analysis included the chronic and acute water quality objectives (WQOs) published in the RWQCB's *Water Quality Control Plan* for the San Francisco Bay. The WQOs correspond to the U.S. EPA Ambient Water Quality Criteria (AWQC) for Saltwater. Where WQOs are not specified in the Water Quality Control Plan, the U.S. EPA Ambient Water Quality Criteria are used as the appropriate WQOs. WQOs have been established for most VOCs, metals, and several PAHs. The chronic WQOs are chemical-specific concentrations in the marine surface water body that are considered protective of the majority (i.e., 90%) of aquatic organisms over a given time period, typically four days. The U.S. EPA AWQC and Basin Plan WQOs are developed from an extensive database that includes toxicity information for multiple phyla and species, and the criterion is based on the most sensitive of the species and test endpoints (e.g., reproductive effects) evaluated. The WQOs are conservative in that they assume that the aquatic organisms are present in the affected water. However, because no marine aquatic organisms have been identified in groundwater at Mission Bay, comparison with such criteria is considered overly conservative with respect to contaminants in groundwater at Mission Bay.

Since metals were detected consistently across the Project Area and appear to be associated with the composition of the fill rather than a specific, identifiable source area, the potential impact of the metals on the aquatic environment has been evaluated by estimating the average concentration entering each surface water body. The potential effects of metals on the near-shore aquatic environment were evaluated for Mission Bay South by estimating the average chemical concentrations in groundwater located in a 500-foot-wide zone adjacent to China Basin Channel and San Francisco Bay and comparing the average concentrations to aquatic criteria. The use of the 500-foot-wide averaging zone was considered an appropriate method for evaluating the potential effects of metals on adjacent water bodies in Mission Bay South for existing conditions because concentrations in the 500-foot-wide zone are generally slightly greater than the average concentrations for the entire Mission Bay South area. In Mission Bay North, all data points except two (which are located approximately 800 feet from China Basin Channel) are located within the 500-foot-wide zone of China Basin Channel. The average concentrations of metals from all data points in Mission Bay North were used to provide a

more comprehensive analysis than would occur from exclusion of the data from the two data points outside the 500-foot zone./9/

Because WQOs have not been established for TPH, toxicity information was derived from recent scientific peer-reviewed literature to provide a basis for assessing potential ecological risk to marine aquatic organisms in the near-shore environment of China Basin Channel and San Francisco Bay. As discussed in the 1998 Mission Bay South report, the majority of efforts to characterize adverse effects of petroleum products to marine aquatic organisms have been associated with toxicity testing of fresh crude oil and refined products in anticipation of surface-water oil spills. A variety of approaches have been used to evaluate potential effects, including preparation of emulsions, elutriates from petroleum-containing soil, and water-soluble fractions. To the extent possible, ENVIRON relied on the results of studies using water-soluble fraction methods that reflect dissolved constituents because the data would be more analogous to groundwater conditions in Project Area. This was considered a conservative approach because the weathered hydrocarbons contain reduced soluble constituents. The results of other water-soluble fraction studies were also used to identify appropriate EC25 values for comparison purposes. (EC25 represents the concentration at which 25% of the test species were affected and are based on a water-soluble fraction from fresh fuel.) Such methods were considered an appropriate and conservative basis for comparisons because they are based on fresh refined products, current toxicity test methods, and rely on sub-lethal developmental endpoints.

Tidal Influence Study

To supplement the direct comparison of measured groundwater concentrations to WQOs or TPH toxicity criteria, the results of a tidal influence study performed as part of the 1997 Mission Bay South investigation were used to determine the extent to which the concentrations in groundwater could be reduced as groundwater adjacent to China Basin Channel and San Francisco Bay moves toward the tidally influenced surface-water bodies that border the South of Channel area to the north and east. The results of the tidal influence model presented in the 1998 Mission Bay South report indicate that the concentration of chemicals will be reduced on average by 10-fold as groundwater flows within the last 50 feet toward China Basin Channel and the San Francisco Bay./10/ Therefore, the average concentration of metals in groundwater prior to entering the China Basin Channel and the San Francisco Bay would actually be lower than the chronic water-quality criteria. A brief description of the tidal influence model, its applicability to both the North of Channel and the South of Channel areas, and a discussion of the output is provided below.

The predictive model simulates how the tidal fluctuations in a surface water body, like the Bay or China Basin Channel, cause water elevations within adjacent groundwater systems to rise and fall and reduce chemical concentrations in the groundwater. Depending on the permeability of the adjacent groundwater system, the tidal effect will extend from a few tens of feet to over a hundred feet inland from the shoreline. As the surface water levels rise, water flows into the channel bank causing groundwater levels to also rise. When surface water levels then decline, water stored in the channel bank drains back to the surface water body. This process substantially reduces the concentration of chemical constituents before water enters the Bay or Channel. The interaction of surface water with the groundwater system occurs in the area where the tidal influence is pronounced. For the type of soils present at the Mission Bay Project Area, this includes areas within 50 feet of the shoreline.

The large concrete box sewers that roughly parallel China Basin Channel on the north and south sides appear to impede groundwater flow from upgradient areas into the Channel. These conditions were discussed in the 1997 Mission Bay North report and the 1998 Mission Bay South report prepared by ENVIRON./11/ The box sewer on the south side is about 100 feet from the Channel, and is over 200 feet from the Channel to the north. While these box sewers appear to impede the general flow of groundwater toward the Channel, their presence should not affect the tidally influenced attenuation which principally occurs within 50 feet of the shoreline. The attenuation produced by tidal fluctuations reduces chemical concentrations that exist in groundwater that lies between the box sewers and the Channel edge. The net effect of the box sewers is to simply reduce the amount of groundwater that enters this area rather than affecting the attenuation process itself.

Tidal fluctuations in the surface water body (the Bay or China Basin Channel) result in the attenuation and reduction of groundwater chemical concentrations through processes of dilution, dispersion, and sorption, all of which occur within the groundwater system prior to groundwater discharging into the Bay or China Basin Channel. The hydraulic interaction of surface and groundwater affects concentrations of both inorganic and organic COPECs that have been identified for the Mission Bay Project Area. The tidally influenced attenuation that reduces groundwater chemical concentrations before groundwater discharges to a surface water body will apply to the North and South of Channel areas because the hydraulic driving forces for the attenuation are common to both areas as are COPECs such as metals and TPH constituents. In Mission Bay North, soils are less permeable adjacent to China Basin Channel which results in tidal fluctuations occurring less far inland and in causing the attenuation process to occur closer to the shoreline than in other areas with higher permeable soils. The 1997 Mission Bay North report reported some fluctuations in groundwater levels in response to tidal variations but dynamic responses were not observed at distances equal to or greater than 70 feet from the shoreline./12/ Monitoring well MW-5 was the well closest to the shoreline to be used in the study. MW-5 is about 70 feet from the shoreline. The tidal attenuation

model predicts that the effects of the tidal influence will be in a zone of less than 50 feet inland from the shoreline given the types of soils that are present along the shoreline in the North of Channel area. Therefore, the observations of small groundwater level changes at distances greater than 50 feet from the shoreline reported in the 1997 Mission Bay report is entirely consistent with the model's prediction that the tidal influence and attenuation zone will be active in an area less than 50 feet from the shoreline./13/

The quantification of the attenuation of groundwater chemical concentrations as groundwater approaches the San Francisco Bay or the China Basin Channel was estimated on a one-dimensional basis and is conservative because it does not allow for lateral dispersion, dilution, or sorption that occur in a three-dimensional system. If full three-dimensional mixing and attenuation were taken into account, the attenuation factor and the associated reductions in groundwater chemical concentrations would be greater than the 10-fold reduction presented above.

METHODOLOGY TO EVALUATE HUMAN HEALTH RISK DUE TO EXPOSURE TO UNCONTROLLED CONSTRUCTION-GENERATED DUST

A screening-level risk assessment was prepared by ENVIRON to assess human health risks that could occur during construction activities. The following subsection describes the methodology and assumptions used in that analysis of the potential human health impacts associated with exposure to dust emissions during construction activities at the Project Area, absent implementation of control measures. A screening-level evaluation was conducted that assessed the types of effects that could be encountered in a reasonable worst-case uncontrolled dust emission scenario. That evaluation, discussed below, concluded that the risks to nearby populations, even if continuously exposed to dust generated for 20 years, would be below the target levels specified by the RWQCB for the Project Area. The risk evaluation was conducted following standard regulatory risk assessment guidelines developed by the DTSC and U.S. EPA.

Chemicals of Concern

The screening-level human health assessment evaluated all chemicals found on-site capable of migrating with dust, absent implementation of control measures. Exposure to volatile organic compounds was not considered because volatile constituents generally do not adsorb to dust. Further, since pesticides and PCBs were detected in less than 1% of the samples, they were not included in the quantitative analysis.

Asbestos was detected in numerous samples across the South of Channel Area. Asbestos is naturally occurring in serpentine rock, found in many areas of California; the rock's presence in the fill is likely attributable to natural formations which originated in other areas of the city (such as Irish Hill) and were used to fill in the Mission Bay. The risk associated with exposure to asbestos fibers is related to the potential for the asbestos in the rock to be friable and become airborne and the size of the airborne fiber. Because it is not known to what extent the asbestos in the fill could become airborne, nor how much of any asbestos could be in the respirable size range, it is not typically quantitatively evaluated at construction sites and consequently has not been included here in this screening-level quantitative evaluation. Asbestos-containing rock is commonly found at many construction projects in San Francisco and other areas of California. Any potential impacts associated with emissions of respirable asbestos, however, would be managed as recommended by BAAQMD for PM₁₀ emissions. Further, workers engaged in the construction activities within the Project Area will be subject to asbestos construction standard (Title 8 CCR Section 1529), if applicable.

Potentially Exposed Populations, Exposure Pathways, and Exposure Assumptions

Populations that could be exposed to the chemicals adsorbed to dusts during construction activities, absent implementation of control measures, include any in the nearby vicinity of the area being developed. As described above, the nearby populations include those populations that would be directly adjacent to the area being developed, in addition to populations located further away from the specific development area. For this screening-level analysis, ENVIRON assumed that nearby populations exposed to high dust levels could be either workers or residents and that the nearby populations would be located directly adjacent to the area under construction. The residential population assumption includes both adults and children. Risks to the construction worker engaged in the development of the Project Area have not been calculated since exposures to these workers would be controlled through Cal/OSHA requirements.

The primary pathway through which exposure to dusts could occur is the inhalation pathway. Exposure to dusts can also occur through secondary exposure pathways, such as the deposition of dusts onto nearby soils and subsequent dermal contact with the soils. The analysis prepared by ENVIRON provides a worst-case estimate of the exposures that could occur through the primary inhalation pathway. Exposures due to the secondary pathways would be small relative to the worst-case exposures that could occur from the primary inhalation pathway and would only minimally contribute to risks associated with the primary pathway.

The development of the Project Area is assumed to be complete by the year 2015. For purposes of this screening-level human health risk evaluation, ENVIRON assumed that the nearby populations

would be located directly adjacent to the area under construction, that they could be exposed to high dust levels for eight hours per day, five days per week, 50 weeks per year, for the entire 20-year period. The basis for establishing the high dust levels used in this risk evaluation is described below. The exposure frequency and duration assumptions overestimate exposure significantly since it is highly unlikely that any one individual would be continuously adjacent to a construction area for the entire 20-year development period. It is more likely that an individual's exposure to construction dust, if uncontrolled, would occur periodically over a very short time period. For these reasons, the uncontrolled exposures estimated in the screening-level evaluation were used for purposes of conservative analysis and represent significant overestimates of the actual exposures that might be realized by individuals within the vicinity of the Project Area.

Toxicity Values

Both carcinogenic and noncarcinogenic effects were considered in evaluating the potential effects associated with uncontrolled dust emissions during construction activities. Further, as recommended by Cal/EPA, lead was evaluated using a separate mathematical model, the Cal/EPA Lead Spread Model. The specific toxicity values used in the screening-level evaluation were those recommended by the Cal/EPA and U.S. EPA. In the absence of chemical specific criteria from Cal/EPA or the U.S. EPA, other regulatory or scientific sources were utilized. For example, procedures established by the Massachusetts Department of Environmental Protection were used to identify indicator chemicals for TPH toxicity.

Exposure Concentrations

Estimating the concentration of chemicals in dusts to which nearby populations could be exposed involved the following two steps: 1) determining the representative concentration of each chemical in soil; and 2) determining the concentration of respirable particulate matter which could be generated during the excavation activities to which individuals could be exposed. Respirable particulate matter is defined as particulates less than 10 microns in diameter (PM_{10}). The analysis performed for each of these steps is summarized below.

Representative Concentrations in Soil

The representative chemical concentrations in soil were estimated from the results of the 1997 Mission Bay South investigation. Consistent with U.S. EPA recommendations for risk assessment, the representative chemical concentration in soil was assumed to be the 95% upper confidence limit (UCL) of the arithmetic mean concentration detected during the Mission Bay South soil investigation.

All soil laboratory analytical data collected from Mission Bay South were included in the screening-level evaluation. Use of these results for the analysis was considered conservative and applicable to the entire Project Area since the concentrations of chemicals in Mission Bay South were consistently greater than those found in Mission Bay North.

Dust Levels Generated During Construction Activities

Construction-related emissions of PM_{10} are generally temporary in duration. Furthermore, the emissions result from a variety of activities and are highly dependent on several factors, such as the specific activities taking place, weather and climate, and soil conditions. This multitude of factors makes estimation of emissions difficult, and often the estimates are inaccurate. Thus, BAAQMD recommends that, for the purposes of a California Environmental Quality Act (CEQA) evaluation of PM_{10} emissions, the emphasis of the analysis should focus on the “effective and comprehensive implementation of control measures rather than detailed quantification of emissions.” For this reason, the analysis did not include detailed quantification of PM_{10} emissions.

Rather than conducting detailed emissions estimates, nearby populations (defined as populations directly adjacent to the construction zone) were assumed to be exposed for an entire 20-year period to a worst-case, annual average, airborne dust concentration of 250 micrograms per cubic meter ($\mu g/m^3$) respirable dust generated from construction activities, absent implementation of control measures. The rationale for this assumption is provided below.

Based on the information in the scientific, peer-reviewed literature as well as recommendations provided by DTSC, the on-site ambient dust concentration directly within the construction zone during dust-generating activities was assumed to be $1000 \mu g/m^3$ of PM_{10} . Because only certain activities associated with the development of a parcel would actually consist of significant dust-generating activities, ENVIRON assumed that dust-generating activities would occur approximately 25% of the total construction time. Thus, the annual average level of PM_{10} in the ambient air to which nearby populations (i.e., populations directly adjacent to the construction zone) would be exposed for an entire 20-year period was assumed to be $250 \mu g/m^3$ of PM_{10} . This value is considered to be extremely conservative; the actual concentrations to which an individual could be exposed likely will be much lower for the following reasons:

- The figure of $1,000 \mu g/m^3$ of PM_{10} was based on a review of typical concentrations of dust on active construction sites, where ambient concentrations have been measured at levels such as $150 \mu g/m^3$ of total suspended particulate (TSP), $450 \mu g/m^3$ of PM_{10} , and $1,000 \mu g/m^3$ of PM_{10} . While it is possible that certain activities could result in periodic ambient dust levels of $1,000 \mu g/m^3$ within the construction zone, it is highly unlikely that the average concentration would be as high as $1,000 \mu g/m^3$ during the periods of time when dust-generating activities are occurring.

- Dust levels outside of the construction zone would be significantly lower than the dust levels within the construction zone as the distance from the dust-generating activity increased.
- Specific soil conditions, such as moisture content and particle size distribution, will affect the rate at which dust is generated.
- Dust levels in the indoor environment, where the nearby populations would be spending the majority of their time, would be significantly lower than the levels that could be present outdoors.
- A person would only be exposed to dust from the construction activity for the percentage of time when the person was downwind of the activity. Based on variability in both wind direction and wind speed, a person would only be directly downwind of the construction zone for a fraction of the year.
- Precipitation will significantly reduce dust emissions from construction activities.
- ENVIRON assumed that dust-generating activities would occur 25% of the total 20 year construction time. Considering the various different construction activities associated with the development of the Project Area, such as paving the building foundations, structural work, and exterior and interior detailing, it is likely that dust-generating activities will occur for significantly less than 25% of the total construction time.
- Since the total development of the Project Area is expected to occur over a 20- year period, it is highly unlikely that any one individual would be exposed continuously to dust emissions generated from the project development for that 20-year period.

POST-DEVELOPMENT RISK EVALUATION METHODOLOGY

A human health and ecological risk evaluation was prepared by ENVIRON for constituents present in the soil and groundwater in the Mission Bay South area. Soil in Mission Bay South is principally fill materials placed in the late 1800's and early 1900's, largely comprised of soil and debris originating in other parts of San Francisco. The risk evaluation was conducted following the standard regulatory risk assessment guidelines promulgated by the California Environmental Protection Agency (Cal EPA) and the United States Environmental Protection Agency (U.S. EPA). The human health risk evaluation was conducted to assess whether the levels present in the soil and groundwater in the Mission Bay South area would present a risk to the future populations that may be present after project completion. Similarly, the ecological risk evaluation was conducted to ascertain whether the constituent levels present in the soil and groundwater would pose a risk aquatic organisms in nearby China Basin Channel and San Francisco Bay after project completion. A brief description of the methodology, assumptions, and conclusions of the human health and ecological risk evaluation are presented below.

Human Health Risk Evaluation

Introduction

The human health risk evaluation was conducted by developing site-specific target levels (SSTLs) for each of the chemicals present in the soil and groundwater to which humans may be exposed. The SSTLs were developed using standard risk assessment techniques and regulatory assumptions; they represent the concentrations of individual chemicals that could be present in the soil or groundwater that are protective of the human populations that might be present in Mission Bay South. A comparison of the concentration of chemicals detected in the soil and groundwater to the health-based SSTLs provides the basis for determining whether the chemicals present in the Mission Bay South area would pose a risk to human health and provides a basis for identifying areas where risk management measures may be needed. The SSTLs developed for Mission Bay South were applied also to Mission Bay North because the populations that would be present in Mission Bay North at build-out and the type of development would be generally the same as that proposed for Mission Bay South./14/

The SSTLs were developed using methods consistent with the Risk-Based Corrective Action (RBCA) methodology, as developed by the American Society for Testing and Materials (ASTM) and described in ASTM E-1739, "*Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, 1995.*" RBCA represents a streamlined process for assessing and responding to releases of chemicals, including hydrocarbons and, therefore, is appropriate for assessing potential risk due to contaminants that have been detected in soil and groundwater in the Project Area. The RBCA approach integrates U.S. EPA risk assessment practices with traditional site investigation and remedy selection activities in order to determine cost-effective measures for protection of human health and environmental resources. ENVIRON used the RBCA Guidance, combined with specific methods and assumptions developed and/or recommended by U.S. EPA, San Francisco Regional Water Quality Control Board (RWQCB), Cal/EPA's department of Toxic Substances Control (DTSC) and the U.S. EPA in the development of SSTLs.

The human health risk evaluation was conducted under the assumption that Risk Management Plan (RMPs) would be used to guide the development and subsequent management of activities in the Project Area with respect to contaminated soil and groundwater. The RMPs would provide a framework to manage residual chemicals in soil and groundwater in a manner consistent with intended land use and to be protective of both human health and the environment.

The development plans for the Project Area would result in all currently exposed soils being covered by parking areas, sidewalks, roadways, building foundations, landscaping, or public parks. Further, all landscaping and public parks would consist of horticultural-quality fill on top of existing soil. Thus, all future residents, commercial and retail workers, and visitors who may be present in the Project Area would not have direct contact with native soil. The only future populations that may have direct contact with the native soils and groundwater would include construction workers involved in the development of the property, or future maintenance workers involved in subsurface work, such as sewer pipe repair. Exposures incurred by the construction or maintenance workers would be mitigated through the implementation of a worker health and safety plan and the establishment of worker health and safety training requirements. The health and safety training requirements and the development and implementation of a health and safety plan would also be delineated in the RMPs prepared for each development site.

Potentially Exposed Populations and Pathways

To determine whether the levels of constituents present in the soil and the groundwater would pose a health risk to the human populations that may be present in the Mission Bay South area under the proposed project, it is necessary to identify both the populations that may potentially be exposed to the chemicals present in the area and the pathways by which exposures may occur.

Identification of the potentially exposed populations requires evaluating the proposed human activity and land use patterns planned for the proposed project. Once the potentially exposed populations are identified, the complete exposure pathways by which individuals may contact chemicals present in the soil and groundwater must be determined. An exposure pathway is defined by U.S. EPA as "the course a chemical or pollutant takes from the source to the organism exposed." As noted in the 1998 Mission Bay South report, the U.S. EPA defines exposure route as "the way a chemical or pollutant enters an organism after contact." A complete exposure pathway for chemicals on a site requires four key elements: chemical sources; migration routes (i.e., by mouth, skin, or inhalation). An exposure pathway is not complete unless all four elements are present.

Conceptual Site Model

A Conceptual Site Model is used to show the relationship between chemical sources, exposure pathways, and potential populations (often referred to as "receptors"). The Conceptual Site Model identifies the following: 1) plausible chemical sources; 2) the potentially impacted media; and 3) the potential receptors and their exposure routes for contacting the impacted media. The source-pathway-receptor relationships provide the basis for quantitative exposure assessment. Complete source-

pathway-receptor relationships are included in the quantitative risk assessment and those that are incomplete are screened from further evaluation. There are many plausible historical sources of chemicals in the Project Area. First, shallow soils across most of the Project Area are comprised of fill materials placed beginning in the mid-1800's to the early 1900's. The fill materials contain a variety of chemicals, particularly metals, depending on the precise origin history of the fill area within Mission Bay being investigated. Additionally, sources of chemicals may have included spills and/or leaks from underground storage tanks (USTs) or above-ground storage tanks (ASTs), and releases from numerous industrial facilities, such as the bulk oil storage facility, underground pipelines, lumberyards, railroad yards, auto repair shops, and shipbuilding facilities. Once released into the surface or subsurface soils, the potential secondary release mechanisms include the following:

- Volatilization of constituents into ambient (i.e., outdoor) or indoor air;
- Migration of constituents down to the groundwater;
- Volatilization of constituents in groundwater up through the soil column into ambient or indoor air; and
- Migration of constituents in groundwater into surface water.

Exposed Populations

The proposed redevelopment of Mission Bay North and Mission Bay South would include a variety of land uses, including: multi-family housing; commercial, entertainment, and retail uses; a hotel; a possible police and fire station; open space and parks; and office/research and development facilities. Child care centers could also be located within each of the major land use designations, and it is anticipated that a single site anywhere in the Project Area could be developed as a school, most likely a primary school. In addition, approximately 43 acres within the Mission Bay South would be transferred to the University of California San Francisco (UCSF) for construction of additional research space. Based on the present development plans, the populations that would be present in the Project Area include the following:

- On-site and off-site retail and commercial workers (including maintenance and construction workers);
- On-site and off-site residents (both adults and children);
- Park visitors (both adults and children);
- Visitors to and shoppers at commercial and retail establishments;

- Child care and school facility attendees (both adults and children); and
- Students, faculty, and support staff at UCSF.

Maintenance and construction workers would be present in the future and may have occasion to dig into the subsurface soil; their exposure and protection would be addressed as part of the RMPs to be prepared for each development site.

Exposure Pathways

Given the stated development plans, the potential human populations may come into contact with constituents present in the soils or groundwater through the following pathways:

- Inhalation of vapors from soil
 - ▶ vapors present in ambient (i.e., outdoor) environment
 - ▶ vapors that have accumulated in indoor spaces
- Inhalation of vapors from groundwater
 - ▶ vapors present in ambient (i.e., outdoor) environment
 - ▶ vapors that have accumulated in indoor spaces

Because the existing soil and other areas would be covered by buildings, paving, or landscaping in raised beds, access to the existing native soil by commercial workers, residents, park visitors, or any other populations in the Project Area would be precluded. An important component of this conclusion is that the project would not include single family residences with frontyards or backyards where soil disturbance or unrestricted access to the native subsurface soil could occur. RMPs are proposed to specifically include measures to prohibit uncontrolled direct contact with native soil and groundwater. Thus, direct contact with existing soil in the Project Area and direct contact with groundwater as a result of subsurface digging are considered “incomplete pathways” for future commercial workers, residents, or park visitors.

The shallow groundwater is not suitable as a drinking water source because of limited quantity and high total dissolved solids (TDS). Furthermore, any future use of the groundwater for commercial or industrial purposes is proposed to be prohibited as a condition of site development, and would be clearly specified as such in RMP. Thus, exposure to constituents in groundwater through ingestion and dermal contact is considered an incomplete exposure pathway in the analysis.

The only future populations that may have direct contact with the soils and groundwater would be construction workers involved in the development of the property, or future maintenance workers involved in subsurface work, such as sewer pipe repair. Exposures incurred by the construction or maintenance worker would be minimized through the implementation of a worker health and safety plan and the establishment of worker health and safety training requirements. Exposures to nearby residents/commercial workers that may occur during the development of the Project Area would be addressed in the RMPs.

Chemicals of Potential Concern

The selection of chemicals included in the health risk evaluation was based upon the Project Area history, the analytical results from the soil and groundwater investigations conducted in Mission Bay South, and the pathways through which exposures to the chemicals may occur.

The groups of chemicals that were detected in the soil and/or groundwater include the following:

- Trace levels of pesticides;
- Other semivolatile organic chemicals (including polycyclic aromatic hydrocarbons (PAHs), and trace levels of di-n-butylphthalate, phenol, and methylphenols)
- Various volatile organic chemicals;
- Metals;
- Asbestos; and
- Total petroleum hydrocarbons (TPH).

Future populations in the Project Area may be exposed to chemicals through the inhalation of vapors that migrate from the soil or groundwater, up through the soil column, into the indoor or outdoor air. Accordingly, SSTLs have been developed for all volatile chemicals detected in either the soil or groundwater. Additionally, since petroleum hydrocarbons consist of a complex mixture of a wide range of chemicals, including some in the volatile range, SSTLs have been calculated for TPH-gasoline, TPH-diesel and TPH-motor oil using an "indicator chemical" approach. The indicator chemical approach for the three ranges of TPH has been used and approved by regulatory agencies, including the DTSC and the RWQCB at other sites in California./15/

In summary, the compounds within the Project Area for which SSTLs have been calculated include all volatile organic chemicals that were detected in the soil and/or groundwater and the three ranges of TPH. It was assumed that there would be no exposures to the nonvolatile constituents detected in the

soil and groundwater in the Mission Bay South area, such as metals, asbestos, trace levels of pesticides and PAHs, because existing soil would be covered either by buildings, paving, or additional soil.

Fate and Transport Modeling

In order to determine the concentration of the constituents present in the soil and groundwater to concentrations that would be expected in the indoor and ambient air, a U.S. EPA-approved transport computer model, VLEACH 2.2a, was used to develop transfer coefficients. VLEACH is a one-dimensional finite-difference vadose zone leaching model simulates the movement of organic constituents as they migrate from the original source media (i.e., soils) to other media (i.e., air and groundwater). An indoor- and outdoor-box model is then used to predict the concentrations of the chemicals that would be present in the indoor and outdoor air. The chemical-specific soil-to-air transfer coefficient is defined as the ratio of the concentration of a chemical in air to that in soil. Similarly, the groundwater-to-air transfer coefficient is the ratio of the concentration of a chemical in air to that in the groundwater. The fate and transport modeling conducted for estimating concentrations present in ambient air assumed that barriers (e.g., pavement, roads, or topsoil) do not exist. Fate and transport modeling used to estimate indoor concentrations of volatiles was conducted using standard regulations assumptions regarding building foundations.

Toxicity Assessment

Chemicals are evaluated for their potential health effects in two categories, carcinogenic and noncarcinogenic. Consistent with regulatory guidance, both carcinogenic and noncarcinogenic effects were considered in the development of the SSTLs for soil and groundwater. The specific toxicity values used in development of the SSTLs were those recommended by the Cal/EPA in "Memorandum to Cal/EPA Departments, Boards, and Offices from Standards and Criteria Work Group, Office of Environmental Health Hazard Assessment re: California Cancer Potency Factors" dated November 1994 and the U.S. EPA's Integrated Risk Information Service (IRIS). In the absence of chemical-specific criteria from Cal/EPA or the U.S. EPA, other regulatory or scientific sources were used. For example, the Massachusetts Department of Environmental Protection *Interim Final Petroleum Policy: Development of Health-Based Alternative to the Total Petroleum Hydrocarbon (TPH) Parameter* (1994) was used to identify indicator chemicals for TPH toxicity.

Development of Health-Based Site-Specific Target Levels

The development of the soil and groundwater SSTLs was based on the relationship between the intake level for the particular compound, the toxicity of the compound and target levels of risk. Consistent with current regulatory policy at both the RWQCB and the Cal/EPA's DTSC, the cancer risk criterion used for the evaluation is 10 in 1 million (1×10^{-5}). For noncancer health hazards, a target hazard index (HI) of one (1) is used. The basic methodology used to derive the SSTLs for the selected chemicals of concern was based on guidance provided in the four documents listed below./16/

- American Society for Testing and Materials, *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM-E 1739-95, 1995.
- U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A), Interim Final*, EPA/540/1-89/002, December 1989.
- U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals)*, Publication 9285.7-01B, December 1991.
- Massachusetts Department of Environmental Protection, Office of Research and Standards, *Interim Final Petroleum Policy: Development of Health-Based Alternative to the Total Petroleum Hydrocarbon (TPH) Parameter*, June 1994.

The SSTLs are based on the relationship between the intake level for the particular compound, the toxicity of the compound, and an established level of risk (i.e., a criterion or threshold). To estimate the concentration of a given chemical that corresponds to an established health risk-based criterion, chemical exposures are quantified using mathematical modeling. The quantitative estimates of exposure are then combined with a toxicity value for that chemical to calculate the concentration of chemical that could be present that corresponds to the established risk criterion. A comparison of the concentration of chemicals detected in the soil and groundwater to the health-based SSTLs provides the basis for determining whether the chemicals present would pose a risk to human health. The model establishes the relationship between the concentration of a chemical in the soil or groundwater and the concentration that would be present in the air.

The SSTLs shown in Tables I.19 and I.20 represent the theoretical concentration of each chemical that could be present in the soil and groundwater and that would not exceed established risk criteria (i.e., cancer risk level of 10 in 1 million and a Hazard Index of 1), and therefore, would be protective of human health. As indicated in Table I.19, many of the SSTLs calculated to protect

TABLE I.19
COMPARISON OF STRICTEST SOIL SITE-SPECIFIC TARGET LEVELS (SSTLs) AND MAXIMUM DETECTED SOIL CONCENTRATIONS FOR MISSION BAY PROJECT AREA /a/

Chemical	SSTL Future On-Site Resident ^b		Maximum Detected Soil Concentration (mg/kg)	
	Adult (mg/kg)	Child (mg/kg)	Mission Bay North	Mission Bay South
TPH-Gasoline	SAT (14,000)	SAT (1,200)	ND	490
TPH-Diesel	SAT (150,000)	SAT (28,000)	240	12,000
TPH-Motor Oil	SAT (> 1,000,000)	SAT (790,000)	2,800	4,300
1, 1, 1-Trichloroethane	SAT (74,000)	SAT (6,300)	ND	ND
1, 1, 2-Trichloro-1, 2, 2-trifluoroethane	SAT (> 1,000,000)	SAT (660,000)	ND	0.0082
1, 1-Dichloroethane	460	460	ND	ND
1, 2-Dichloroethane (cis)	SAT (2,600)	220	ND	ND
1, 2-Dichloroethylene (trans)	SAT (5,200)	450	ND	ND
2-Butanone (MEK)	SAT (770,000)	SAT (73,000)	ND	0.12
2-Hexanone	1,800	150	ND	0.016
Acetone	SAT (310,000)	29,000	0.071	0.77
Benzene	26	26	ND	0.27
Carbon disulfide	SAT (52,000)	SAT (4,400)	ND	0.043
Chlorobenzene	SAT (5,300)	SAT (460)	ND	ND
Chloroform	140	140	ND	0.0062
Ethylbenzene	SAT (75,000)	SAT (6,400)	ND	2.7
m & p-Xylene(s)	SAT (530,000)	SAT (45,000)	ND	8.0
Methylene chloride	780	780	ND	0.11
o-Xylene	SAT (530,000)	SAT (45,000)	ND	4.9
Styrene	SAT (78,000)	SAT (7,900)	ND	0.051
Tetrachloroethylene (PCE)	SAT (120)	SAT (120)	ND	0.011
Toluene	SAT (30,000)	SAT (2,600)	ND	4.3
Trichloroethylene (TCE)	260	160	ND	0.11
Trichlorofluoromethane	SAT (77,000)	SAT (6,600)	ND	0.0050
Vinyl Chloride	10	10	ND	ND

Notes:

mg/kg = milligrams per kilogram

ND = chemical not found above laboratory detection limits

SAT = The calculated SSTL exceeds soil saturation limit

a. See discussion under "Potential Effects on Human Health After Development."

b. The SSTL indicated in parentheses represent an SSTL that is greater than the soil saturation limit for that compound. These SSTLs, even if greater than the soil saturation limit, represent a conservative, health-protective estimate of the concentration of chemical that can be present in the soil without exceeding the established risk criteria, and has been provided in order to estimate the cumulative risk associated with the presence of multiple chemicals. See text under "Human Health Risk Assessment" for further explanation of the SSTLs.

Source: ENVIRON International Corporation, Addendum 1 to the *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, April 1998, Table 5-6.

human health exceed the soil saturation limit (the maximum amount of that chemical that can be in soil, indicated by an “SAT”) for that compound. Similarly, many of the SSTLs in Table I.20 exceed the solubility limit (the maximum amount that can be dissolved in groundwater, indicated by an “>S”) for that particular compound. For these situations, the health-based SSTL is indicated in parentheses following the “SAT” or “>S” notation. An SSTL value not preceded by an “SAT” or “>S” does not exceed its soil saturation limit or solubility limit. When the health-based SSTL for a compound exceeds the soil saturation limit or the solubility limit for that compound, the presence of saturated soil or groundwater does not, itself, constitute a significant risk to human health. For example, the soil saturation limit for o-xylene is 82 mg/kg. The soil SSTL for the future onsite resident child, however, is 45,000 mg/kg. Thus, the presence of xylene-saturated soil assuming that the measured concentrations are below 45,000 mg/kg, would not adversely impact the health of the child resident exposed under the conditions assumed in this evaluation./17/

Many of the uncertainties in the exposure assumptions, combined with the toxicity assumptions, overestimate the potential risk. This results in SSTLs that are lower than those required to protect public health. Because the SSTLs are based on the risk assessment principles and basic methods described in the documents listed above, the results of the risk assessment and the risk-based target levels presented are directly comparable to the results of other risk assessments prepared following the basic principles identified in U.S. EPA’s RAGS Manual. Both the U.S. EPA and Cal/EPA risk assessment guidelines are based on RAGS principles. More specifically, the methods of calculating a lifetime incremental probability of cancer for carcinogenic chemicals and the methods of calculating a hazard index as described in RAGS is the same core evaluation used in the calculation of the SSTLs prepared for Mission Bay South. The method used for selecting chemicals for risk assessment was based on chemical selection criteria outlined in RAGS, and the toxicity factors used in the document are the same factors used by the U.S. EPA and Cal EPA. The approach used here to develop toxicity factors, when U.S. EPA and Cal EPA toxicity factors are lacking, is the same basic indicator chemical approach described by the U.S. EPA in RAGS, supplemented by specific recommendations for the selection of indicator chemicals recommended by the Massachusetts Department of Environmental Protection. The exposure quantification element of the evaluation was based on the concept of Reasonable Maximum Exposure (RME) described in RAGS. According to the concept of RME, risk assessments should be designed to quantify a level of exposure that would capture 90 to 95% of the exposed population, so only 5 to 10% of the population would have an exposure greater than that quantified in the risk assessment. Quantifying an RME level of exposure is typically achieved through the use of default exposure assumptions listed in U.S. EPA’s “Supplemental Guidance - Standard Default Exposure Factors” included in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals)* and recommended parameter values for chemical fate and transport modeling.

TABLE I.20
COMPARISON OF STRICTEST GROUNDWATER SITE-SPECIFIC TARGET LEVELS (SSTLs) AND MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS FOR PROJECT AREA /a/

Chemical	SSTL Future On-Site Resident ^b		Maximum Detected Groundwater Concentration (mg/L)	
	Adult (mg/L)	Child (mg/L)	Mission Bay North	Mission Bay South
TPH-Gasoline	68	29	8.3	36
TPH-Diesel	>S (17,000)	>S (11,000)	48	330
TPH-Motor Oil	>S (130,000)	>S (82,000)	7.1	4.7
1, 1, 1-Trichloroethane	1,500	670	ND	0.0026
1, 1, 2-Trichloro-1, 2, 2-trifluoroethane	>S (5,600)	>S (2,400)	ND	ND
1, 1-Dichloroethane	50	50	ND	0.0015
1, 2-Dichloroethane (cis)	100	44	0.0071	0.031
1, 2-Dichloroethylene (trans)	230	100	0.0026	0.0069
2-Butanone (MEK)	>S (> 1,000,000)	>S (570,000)	ND	ND
2-Hexanone	320	140	ND	ND
Acetone	490,000	210,000	ND	0.0055
Benzene	2.6	2.6	0.0074	0.24
Carbon disulfide	880	380	0.014	0.0087
Chlorobenzene	460	200	ND	0.005
Chloroform	24	24	0.0018	0.023
Ethylbenzene	>S (3,700)	>S (1,700)	0.047	0.0024
m & p-Xylene(s)	>S (29,000)	>S (13,000)	0.046	0.034
Methylene chloride	190	190	ND	ND
o-Xylene	>S (29,000)	>S (13,000)	0.043	0.012
Styrene	>S (10,000)	>S (5,000)	ND	ND
Tetrachloroethylene (PCE)	2.8	2.8	0.18	0.0013
Toluene	>S (1,500)	>S (640)	0.016	0.041
Trichloroethylene (TCE)	15	15	0.007	0.0036
Trichlorofluoromethane	390	170	ND	ND
Vinyl Chloride	0.046	0.046	ND	0.038

Notes:

mg/L = milligrams per liter

ND = chemical not found above laboratory detection limits

S = The calculated SSTL exceeds the solubility limit for that compound.

a. See text under "Health Risks to Future Occupants and Visitors."

b. The SSTL indicated in parentheses represents an SSTL that is greater than the maximum possible dissolved concentration. These SSTLs, even if greater than the solubility limit, represent a conservative, health-protective estimate of the concentration of chemical that could be present without exceeding the established risk criteria, and has been provided in order to estimate the cumulative risk associated with the presence of multiple chemicals. See text under "Human Health Risk Assessment" for further explanation of the SSTLs.

Source: ENVIRON International Corporation, Addendum 1 to the *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, April 1998, Table 5-7.

Where agency default values are absent (i.e., frequency and duration of park visits), site-specific assumptions intended to capture the 90th percentile of the potentially exposed populations are used.

In addition to the use of site-specific exposure assumptions for factors for which the agencies have not developed default recommendations, site-specific conditions were included in the fate and transport modeling conducted for the Mission Bay South area. Thus, the SSTLs presented are based on a conservative combination of agency default values and site-specific factors designed to protect human health.

Although there are limited documented cases of both synergism and antagonism, additivity is the standard default assumption in human health risk assessment, and is considered the only practical way of accounting for multiple effects from simultaneous exposure to more than one chemical.

Accordingly, in the human health risk evaluation for the Mission Bay Project Area, it was assumed that both the cancer and noncancer cumulative risks resulting from simultaneous exposure to the multiple chemicals in multiple environmental media are additive. As recommended by current guidance, the human health risk evaluation did not attempt to account for either potential synergistic effects, or for potential antagonistic effects, because the existing toxicity data are not sufficient to determine the practical or quantitative significance of toxic interactions at environmental levels of exposure./18/

Ecological Risk Evaluation

Risks to the ecological environment under post-development conditions were qualitatively evaluated in *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area* prepared by ENVIRON. Once development of the Project Area is complete, terrestrial and nesting avian species would not be exposed to exposed soils that may contain contaminants. Based on the results of the ecological risk assessment described above, current groundwater conditions are not considered to present an adverse risk to the near-shore aquatic environment (with the exception of the petroleum free product area). Development of the Project Area, which would include implementation of RMPs, would reduce potential effects under future conditions. Rainwater infiltration through soils containing residual contaminants and subsequent migration of the chemicals into the marine ecosystem would be reduced. Stormwater runoff controls would also minimize the potential for contaminants to be discharged to surface water.

NOTES: Appendix I, Contaminated Soils and Groundwater

1. Environmental Science Associates, *Mission Bay Hazards Mitigation Program*, August 1990.

2. ENVIRON International Corporation, *Results of Investigation, Mission Bay North of Channel, San Francisco, California*, April 22, 1997; ENVIRON International Corporation, *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, February 1998.
3. As discussed in Section 2.3.3.3 of *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, prepared by ENVIRON in April 1998, the detection of acetone (or methylene chloride) in field and laboratory control samples does not compromise the accuracy or precision of any other analytical result for any other chemical constituent.
4. ENVIRON International Corporation, *Results of Investigation, Mission Bay North of Channel, San Francisco, California*, April 22, 1997, p. 3-11.
5. As discussed in Section 2.3.3.3 of *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, prepared by ENVIRON in April 1998, the detection of acetone (or methylene chloride) in field and laboratory control samples does not compromise the accuracy or precision of any other analytical result for any other chemical constituent.
6. ENVIRON International Corporation, *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, April 1998; *Technical Memorandum #2, Development and Screening of Remedial Alternatives for Free Product Area in Region of Former Oil Storage Facilities*, April 1998; and *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, April 1998.
7. Developed by ENVIRON in 1995 and presented in Appendix E of *Derivation of Interim Remediation Goals for Acute Exposures to Chemical in the Soil, Draft Remedial Work Plan, Former Alhambra Manufactured Gas Plant Site, Alhambra, California*.
8. See also ENVIRON International Corporation, *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, April 1998.
9. ENVIRON International Corporation, *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, April 1998, Section 4.2; ENVIRON International Corporation, *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel, San Francisco, California*, February 1998, p. 5-27.
10. ENVIRON International Corporation, *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, February 1998, pp. 5-21 and 5-27 to 5-29, and Appendix H.
11. ENVIRON International Corporation, *Results of Investigation, Mission Bay North of Channel, San Francisco, California*, April 22, 1997, p. 4-1; ENVIRON International Corporation, *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, February 1998, p. 4-3.
12. ENVIRON International Corporation, *Results of Investigation, Mission Bay North of Channel, San Francisco, California*, April 22, 1997, p. 4-1.
13. ENVIRON International Corporation, *Technical Memorandum #3, North of Channel Screening-Level Ecological Risk Evaluation, Mission Bay Project Area*, April 1998, Section 4.2.
14. ENVIRON International Corporation, *Technical Memorandum #1, Approach to a Plan for Risk Management, Mission Bay Project Area*, Appendix C, April 1998, p. C-1.

15. The approach for using indicator chemicals to establish SSTLs for petroleum hydrocarbons is explained in detail in Appendix F of *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, ENVIRON International Corporation, February 1998.
16. See ENVIRON International Company, *Site Investigation and Risk Evaluation Report: Mission Bay South of Channel*, Appendix F (February 1998) for additional technical memoranda and other guidance documents used in the development of the SSTLs.
17. It should be noted that if the concentration of the compound in soil exceeds saturation (i.e., if compound-saturated soils are present), the model used to calculate the SSTL is no longer strictly physically valid. In this application, however, where the exposure occurs only through the inhalation pathway, the model provides a conservative estimate of the risk posed by the compound because the model will overpredict the amount of chemical that would be present in the air. Thus, even if compound-saturated soils or free products are present, the use of the SSTLs to estimate cumulative risk associated with exposure to multiple chemicals is health-protective and will overstate the actual risk that may be posed by the presence of the compound in saturated soils.
18. ENVIRON International Corporation, Addendum 2 to the *Site Investigation and Risk Evaluation Report, Mission Bay South of Channel*, April 1998.

J. HYDROLOGY AND WATER QUALITY

OPERATION OF COMBINED SEWER SYSTEM

San Francisco's combined sewer system (see Figure J.1) performs three basic steps of operation:

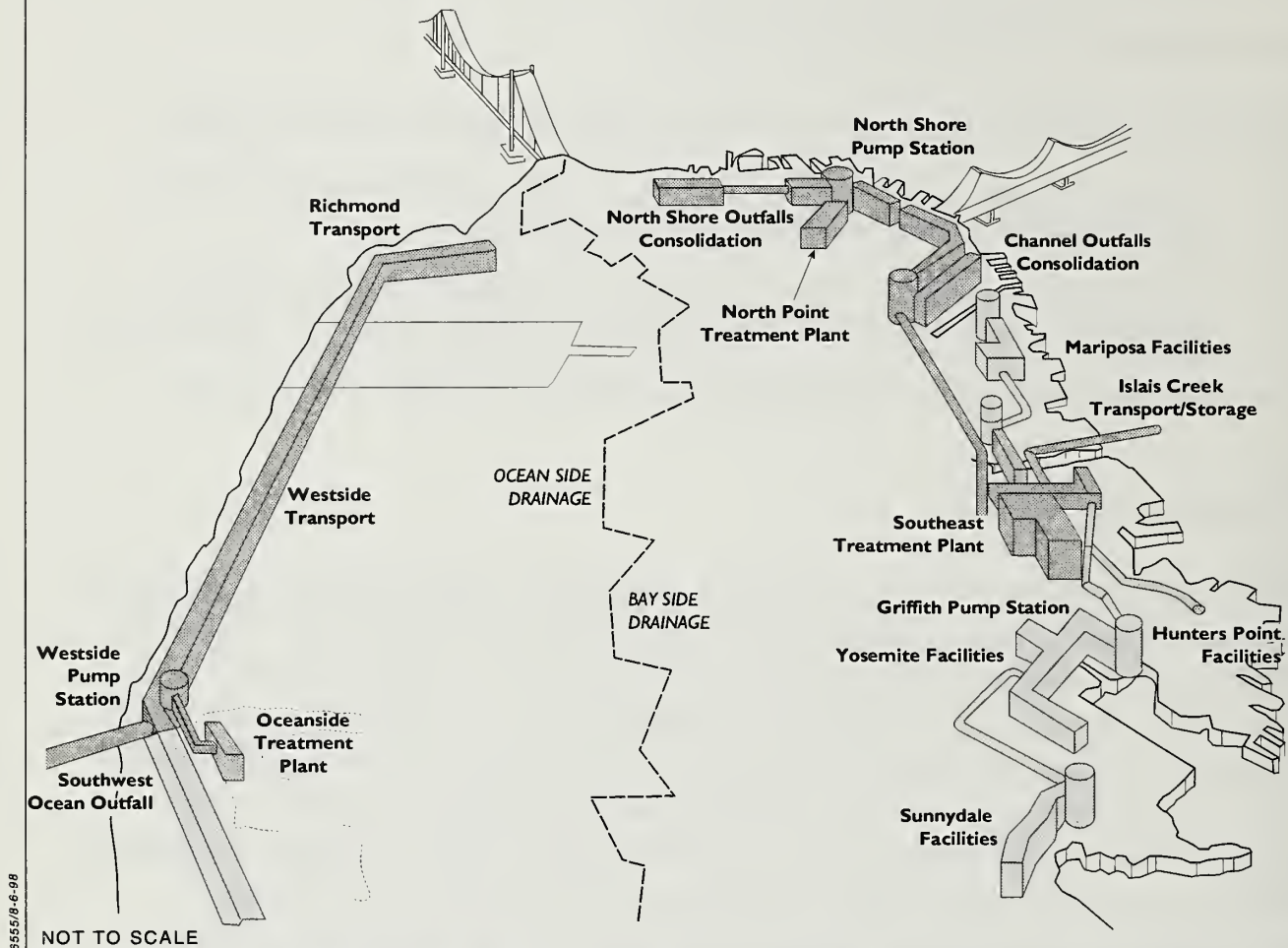
- A series of transport/storage facilities around the perimeter of the City captures the City's combined sewage (municipal wastewater and stormwater runoff).
- The combined sewage stored in the transport/storage facilities flows either directly to a treatment plant, or to a pump station, which pumps the combined sewage to a treatment plant.
- The combined sewage is treated and discharged into the San Francisco Bay or ocean.

Transport/Storage Facilities

The transport/storage facilities are very large-sized, underground, mostly-rectangular tunnels ringing the City. They are operated in conjunction with the pump stations to provide large-volume storage needed during wet weather for later treatment at the treatment plants. Combined sewage is stored until treatment capacity becomes available at the treatment plants. Up to 195 million gallons can be stored in the City's transport/storage facilities. In general, total storage capacity is equivalent to two days of waste flow during dry weather. The transport/storage facilities provide "flow-through treatment" consisting of settling and removal of floatable materials prior to conveyance of combined sewage to the treatment plants. Treated combined sewer overflows (CSO) to the near-shore environment occur when the storm flows exceed the system's total storage capacity (including the storage/transport and the capacity of the treatment plants).

Treatment Plants

The Southeast Water Pollution Control Plant near Third Street and Evans Avenue treats combined sewage from the eastern side of the City. The Oceanside Water Pollution Control Plant located near the San Francisco Zoo treats combined sewage from the western side. The Southeast Plant and the Oceanside Plant provide full secondary-level treatment for a combined maximum of 107 million gallons per day (MG/day) during dry weather. Average current dry-weather sewage generation by the City is about 84 MG/day. During storms, Southeast Plant and Oceanside Plant operators can double or triple the normal rate of waste treatment in order to treat wet-weather flows. Prior to a storm, plant operators increase the population of bacteria, which consume and stabilize the pollutants in the combined sewage. Together, the two plants have a maximum wet-weather capacity of 315 MG/day—193 MG/day of secondary-level treatment and 122 MG/day of primary-level treatment.



96555/B-6-98

SOURCE: San Francisco Public Utilities Commission, 1997.

MISSION BAY SUBSEQUENT EIR

● **FIGURE J.1 SAN FRANCISCO CLEAN WATER PROGRAM
COMBINED SEWER SYSTEM CONCEPTUAL DIAGRAM**

During wet weather, both the Southeast Water Pollution Control Plant and the North Point Water Pollution Control Plant provide treatment for stormwater runoff for the Bayside. During dry weather, the entire flow is pumped to the Channel Outfalls Consolidation, and the North Point Plant remains idle. The North Point Plant is activated when the stored volume of combined sewage in the North Shore Outfalls Consolidation reaches a certain level, providing primary-level treatment for combined storm flows up to 150 MG/day. Generally, the North Point Plant serves the northern half of the Bayside drainage.

Pump Stations

The major pump station facilities exist near the transport/storage sewers. Generally, municipal wastewater flows to pump stations by gravity through transport/storages or other smaller sewer lines, and is pumped to the treatment plants for treatment. The pump stations have a maximum rate at which sewage can be pumped, but that pump flow capacity is greater than the volume that can be treated. Therefore, pump station capacity is not a limiting factor in the overall wastewater system.

System Efficiency

Wastewater facilities operators utilize three major components of the sewer system to optimize its efficiency—the transport/storage sewers, the wastewater treatment facilities, and the pump stations. During dry-weather conditions the amount of municipal wastewater entering the sewer system fluctuates throughout the day. The system equalizes this by storing wastewater sewage in the transport/storages when generation is high during early afternoon hours, then releasing the stored sewage to the treatment plants when treatment capacity becomes available during early morning hours. The pump stations play an integral role in this system by regulating the inflow of wastewater to the treatment plants. Similarly, different areas of the City experience variable amounts of rainfall during storm events. Pump stations can move the combined sewage toward the treatment plants or to the transport/storages to accommodate these differing rainfalls.

The completion of the Wastewater Master Plan has enabled San Francisco to provide secondary treatment to all dry-weather discharges. The number of treated CSOs has been reduced from 46 to 81 times per year to an average of 1 to 10 times per year. This discharge consists of approximately 8% sewage and 92% stormwater and has received primary-level treatment. Of the total annual wet-weather discharge volume, approximately:

- 66% receives secondary-level treatment;
- 11% receives primary-level treatment;

- 12% receives flow-through treatment in the transport/storage sewers and is discharged into the Bay; and
- 11% receives flow-through treatment in the transport/storage sewers and is discharged into the ocean where it dilutes rapidly./1/

METHODOLOGY OF SELECTION OF INITIAL FLOW DESIGN VOLUME

Federal regulations require stormwater management programs to reduce the discharge of pollutants to the maximum extent practicable (MEP). MEP has not been defined by the federal regulations, but Best Management Practices (BMP) are typically used to achieve MEP, with the ultimate goal being protection of the receiving water. BMPs are selected for their effectiveness based on site-specific characteristics. Some applicable BMPs may be rejected because other effective BMPs serve the same purpose. Other reasons for rejecting certain BMPs are that the BMP would not be technically feasible, or the cost would be prohibitive. BMPs can be either source control BMPs or treatment control BMPs. The initial-flow diversion system proposed by the project is a treatment control BMP.

The success of treatment control BMPs is typically measured against performance standards, which are often related to the type or size of storm that should be used for the design of treatment control BMPs. Treatment control BMPs are commonly designed to control small rainfall events, which generally are storms that occur more frequently than four times per year on average, and to control the initial flows of larger rainfall events. The state's *Municipal Best Management Practice Handbook* recommends the use of runoff-capture curves to develop cost-effective BMPs. The runoff-capture curves relate basin volume to cost, converting the curves to cost-effectiveness curves. The "knee of the curve" is the point at which little increase in percent runoff captured occurs with the increased cost associated with increasing the basin volume. The representative curve for San Francisco/2/ shows that the performance standard for the project to achieve MEP should be capture of 80% of the annual runoff volume, or the runoff resulting from 16.8 inches of San Francisco's average annual rainfall of 21 inches. Catellus' review of historical City rainfall data/3/ indicated that to capture 80% of the annual average rainfall volume would require collecting up to 1 inch of rainfall from each storm./4/ One inch of rainfall is equivalent to a 3-month storm frequency for San Francisco./5/ Thus, the initial-flow diversion system is proposed to capture 80% of the average annual runoff volume from the Project Area.

The City developed and performed a computer simulation specifically for the purpose of verifying that the proposed initial-flow diversion system could capture 80% of the annual average runoff from the Central/Bay Basin. A set of 5-minute rainfall data spanning 14 years was used./6/ Variable inputs into the model included variations in sewer system operating policies, pumping rates, and inline

storage (available capacity within the proposed sewer lines themselves). The results confirmed that 78% of the annual runoff volume could be captured by the initial-flow diversion system if: 1) the proposed pumps can pump 90 cubic feet per second; 2) inline storage is 750,000 gallons; and 3) pumping to the large-capacity Channel box sewer (paralleling China Basin Channel on its south side) stops when capacity in the box sewer is reached. The average annual rainfall during those 14 years of data is 23.7 inches, a slightly wetter period than during the entire 70 years of recorded rainfall data, which averages 21 inches annually. Seventy-eight percent of 23.7 inches is 18.5 inches, which is about equivalent to 88% of the long-term average annual rainfall of 21 inches. Thus, the model results confirm that at least 80% of the average annual rainfall can be captured by the proposed initial flow diversion system.

BAYSIDE PLANNING MODEL

The Bayside Planning Model was developed to meet the City's growing need for a systemwide planning approach to the sizing of storage and pumping facilities. The model simulates wet-weather operations in all CSO facilities on the Bay side. The model can also be used to predict incremental changes in the frequency, duration, and volume of treated CSOs. The model examines changes in watershed parameters and modifications of the CSO system that might occur with large-scale development projects. The model is intended for use as a planning tool to assist the City in sizing its CSO facilities and meeting its permit requirements, and is not intended as a means of monitoring permit compliance.

The primary variable input to the model is hourly rainfall at a single point over a given period of time. In using the model as a planning tool to size CSO facilities or analyze their long-term performance, a 70-year record of historic hourly rainfall at a National Weather Service rain gauge in downtown San Francisco was input into the model to develop the required long-term statistical information.⁷⁷ The primary fixed inputs to the model include watershed areas, runoff coefficients, pumping rates, and storage volumes.

CATELLUS' FEASIBILITY ASSESSMENT OF ALTERNATIVE WASTEWATER TREATMENT TECHNOLOGIES FOR THE MISSION BAY PROJECT

Catellus assessed the feasibility of alternatives to reduce the effects of treated wastewater and stormwater discharges to San Francisco Bay. The alternatives assessed for stormwater treatment included vortex-type sediment traps, cartridge leaf filters, and constructed wetlands. The feasibility study found that each of these technologies has the potential for removing suspended solids (particulate matter) and associated toxic chemicals (primarily heavy metals) associated with

stormwater runoff./8/ The study concluded that the level of performance would be equivalent to the performance of the proposed initial-flow diversion system.

Satellite water-recycling systems designed to minimize water supply demand were also considered as an alternative to the City's proposed Recycled Water Master Plan concept. The analysis concluded that although local water recycling could reduce the volume of wastewater generated, pollutants removed by the recycling process would still require treatment at the Southeast Plant. As the same treatment would be applied to these pollutants as under the project, the effect on the Bay would be similar to the proposed project./9/

Technologies to increase treatment efficiency and to reduce the pollutant loadings to the Bay were also analyzed. The technologies included effluent filtration, nitrification, nutrient removal, and dissolved pollutants removal (i.e., reverse osmosis). Catellus' analysis concluded that, while these technologies would reduce pollutant loading, they were generally not necessary as the Southeast Plant has available capacity to handle the increased dry-weather flow, and could meet its NPDES permit. Catellus also concluded that the additional loading would have no significant impact on the receiving water as the 2.4 MG/day corresponds to a small fraction, 0.75%, of the total municipal wastewater discharges to the Bay south of the Bay Bridge./10/

NOTES: Appendix J, Hydrology and Water Quality

1. San Francisco Public Utilities Commission, *The Clean Water Act - 25 Years of Progress in San Francisco*, June 1997.
2. San Francisco Stormwater Quality Task Force, *Municipal Best Management Practice Handbook*, prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, and Resources Planning Associates, Appendix D, Unit Control Volumes, March 1993, p. D-8.
3. City and County of San Francisco, Clean Water Program, and Hydroconsult Engineers, *Hydrometeorological Report for the City and County of San Francisco*, Table 5-4, Storm "Duration vs. Depth" Frequency Matrix, based on National Weather Service, Federal Office Building Hourly Rainfall for July 1907 - June 1978 (71 years) and the 6-Hour Between Storm Definition, 1984. unpublished.
4. Beth Goldstein, Hydrologic Planning Group, Bureau of Engineering, Department of Public Works, City and County of San Francisco, memorandum to John Bouey, Branch Manager, Lee & Ro, November 10, 1997.
5. Roesner, L.A., E.H. Burgess, J.A. Aldrich, "The Hydrology of Urban Runoff Quality Management," presented at American Society of Civil Engineers (ASCE), Water Resources Planning and Management Conference, New Orleans, LA, May 20-22, 1991, 7 pp.
6. Leah Orloff, San Francisco Water Department, City and County of San Francisco Public Utilities Commission, memorandum to Beth Goldstein, Hydrologic Planning Group, San Francisco Department of Public Works, City and County of San Francisco, re: Mission Bay, November 18, 1997.

7. The 70-year rainfall record includes El Niño events, which occur on the order of once every four years or so. In particular, the rainfall data includes the two wettest El Niños for California—1982-83 (180%-200% of normal) and 1957-58 (170%-190% of normal). (Monteverdi, J., and Null, J., "The Impact of El Niño on Winter Precipitation in the West," Natural Hazards Observer, Vol. XXII, No. 3, January 1998, 3 pp.)
8. Lee and Ro, letter to David Knadle, Project Manager at Catellus Corporation, Subject: Alternative Water Quality Control Technologies for Mission Bay Project, February 20, 1998.
9. Lee and Ro, letter to David Knadle, Project Manager at Catellus Corporation, Subject: Alternative Water Quality Control Technologies for Mission Bay Project, February 20, 1998.
10. Lee and Ro, letter to David Knadle, Project Manager at Catellus Corporation, Subject: Alternative Water Quality Control Technologies for Mission Bay Project, February 20, 1998.

TABLE J.1 ●
CHANGES IN EFFLUENT, OVERFLOW, AND STORMWATER VOLUMES

	Bayside Base Case + Project			Bayside Base Case + Mitigation A			Bayside Base Case + Mitigation B		
	Flow Volume	Flow Volume	Change from Base Case (%)	Flow Volume	Flow Volume	Change from Base Case (%)	Flow Volume	Flow Volume	Change from Base + Project (%)
Bayside Effluent (Deep Water) (MG/yr)	30,203	31,045	842 (2.8%)	31,047	844	(2.8%) 2 (0.0064%)	30,992	789	(2.6%) -53 (-0.17%)
Bayside Overflows (MG/yr)	910	912	2 (0.22%)	910	0	(0%) -2 (-0.22%)	877	-33	(-3.6%) -35 (-3.8%)
Project Area Stormwater Discharge (MG/yr) /a/	15.6	15.9	0.4 (2.6%)	15.9	0.4	(2.6%) 0 (0%)	107.2	91.6	(590%) 91.3 (570%)
Other Bayside (Non-Project Area) Stormwater Discharge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Near-Shore Discharges /b/ (MG/yr)	>926	>928	2.4 (0.22%)	>926	0	(0%) -2 (-0.22%)	>984	58	(6.3%) 56 (6.0%)

Notes:

MG/yr = million gallons per year
N/A = not available

- The stormwater discharges under the Base Case, Project, and Mitigation Scenario A are much less than under Scenario B because under the first three, most of the Project Area stormwater would go to the combined sewer system.
- Near-shore waters include China Basin Channel and the Bay waters adjacent to the Bayside. Data are not available from which to derive volumes and quality of direct stormwater discharges from outside the Project Area. The sum of Bayside CSOs plus direct discharges of stormwater along the Bayside understates the actual total near-shore discharge volume. Therefore, the percentage changes shown for the project and Mitigation Scenarios A and B overstate the volume changes from Base Case and Base-Case-plus-Project conditions.

Source: City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c; EIP Associates.

TABLE J.2 ●
ESTIMATED ANNUAL MASS POLLUTANT LOADING TO BAY
FROM BAYSIDE EFFLUENT DISCHARGES

	Bayside Base Case /a/	Bayside Base Case + Project	Bayside Base Case + Mitigation A	Bayside Base Case + Mitigation B
Effluent Volume (MG/yr) /b/	30,203	31,045	31,047	30,992
Change in Volume from Base Case (%) /c/	—	842 (2.8%)	844 (2.8%)	789 (2.6%)
Change in Volume from Base +Project (%) /c/	—	—	2 (0.0064%)	-53 (-0.17%)
Monitored Pollutant Load (lb/yr)				
Total Suspended Solids	4,100,000	4,200,000	4,200,000	4,200,000
Ammonia, Nitrogen	5,100,000	5,200,000	5,200,000	5,200,000
Oil and Grease	1,300,000	1,300,000	1,300,000	1,300,000
Polynuclear Aromatic Hydrocarbons	36	37	37	37
Arsenic	530	550	550	540
Cadmium	54	55	56	55
Chromium	250	260	260	260
Copper	2,100	2,200	2,200	2,200
Lead	880	910	910	900
Mercury	17	18	18	18
Nickel	1,000	1,000	1,000	1,000
Silver	530	550	550	540
Zinc	13,000	13,000	13,000	13,000
Selenium	180	190	190	180
Cyanide	2,500	2,600	2,600	2,600

Notes:

MG = million gallons
lb = pounds
yr = year

- a. Derived from data in City and County of San Francisco, Public Utilities Commission, Bureau of Water Pollution Control - Southeast Plant, Southeast WPCP Monitoring Report December 1997, January 16, 1998.
- b. Derived from data in City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c.
- c. The percentage change in load is assumed to be the same as the percentage change in volume. While the percentage change reflects the incremental change that would occur in each analysis scenario, there is a level of imprecision associated with the load calculations. Therefore, all load values have been rounded to two significant figures to reflect the statistical uncertainty of the calculations. The significance of each change was evaluated by determining whether the change falls within the range of uncertainty.

Source: EIP Associates.

TABLE J.3 ●
ESTIMATED ANNUAL MASS POLLUTANT LOADING TO BAY
FROM BAYSIDE TREATED OVERFLOWS

	Base Case Bayside/a/	Bayside Base Case + Project	Bayside Base Case + Mitigation A	Bayside Base Case + Mitigation B
Overflow Volume (MG/yr) /b/	910	912	910	877
Change in Volume from Base Case (%) /c/	—	2 (0.22%)	0 (0%)	-33 (-3.6%)
Change in Volume from Base + Project (%) /c/	—	—	-2 (-0.22%)	-35 (-3.8%)
Monitored Pollutant Load (lb/yr)				
Total Suspended Solids	680,000	680,000	680,000	660,000
Ammonia, Nitrogen	9,600	9,600	9,600	9,200
Oil and Grease	61,000	61,000	61,000	59,000
Polynuclear Aromatic Hydrocarbons	4.1	4.1	4.1	4.0
Arsenic	60	60	60	57
Cadmium	17	17	17	16
Total Chromium	91	91	91	88
Copper	300	300	300	290
Lead	470	470	470	450
Mercury	2.8	2.9	2.8	2.7
Nickel	160	160	160	150
Silver	37	37	37	36
Zinc	2,400	2,400	2,400	2,300
Selenium	6.5	6.5	6.5	6.2
Cyanide	38	38	38	37

Notes:

MG = million gallons; lb = pound; yr = year

- Derived from the following data sources provided by Jim Salerno, Laboratory Supervisor, Southeast Water Pollution Control Plant, September 5, 1997:
City and County of San Francisco, Department of Public Works, Bureau of Water Pollution Control, Bayside Wet Weather Overflow Monitoring Program Data Summary, October 1994 - June 1995.
City and County of San Francisco, Department of Public Works, Bureau of Water Pollution Control, Bayside Wet Weather Overflow Monitoring Program Data Summary, October 1995 - June 1996.
City and County of San Francisco, Department of Public Works, Bureau of Water Pollution Control, Bayside Wet Weather Overflow Monitoring Program Data Summary, October 1996 - June 1997.
- City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c.
- The percentage change in load is assumed to be the same as the percentage change in volume. While the percentage change reflects the incremental change that would occur in each analysis scenario, there is a level of imprecision associated with the load calculations. Therefore, all load values have been rounded to two significant figures to reflect the statistical uncertainty of the calculations. The significance of each change was evaluated by determining whether the change falls within the range of uncertainty.

Source: EIP Associates.

TABLE J.4 ●
ESTIMATED ANNUAL POLLUTANT LOADING FROM DIRECT STORMWATER
DISCHARGE TO THE BAY FROM PROJECT AREA/a/

	Bayside Base Case	Bayside Base Case + Project	Bayside Base Case + Mitigation A	Bayside Base case + Mitigation B
Stormwater Volume to Bay from Bay Basin of Mission Bay (MG/yr) /b/	15.6	15.9	15.9	107.2
Change in Volume from Existing (%)		0.4 (2.6%)	0.4 (2.6%)	91.6 (590%)
Change in Volume from Project (%)			0 (0%)	91.3 (570%)
<u>Pollutant Load (lb/yr) /c/</u>				
Total Suspended Solids	8,300	6,600	4,000	27,000
Change in Mass from Existing (%)		-1,700 (21%)	-4,400 (-52%)	18,000 (220%)
Change in Mass from Project (%)			-2,600 (-40%)	20,000 (303%)
Cadmium	0.18	0.21	0.16	1.1
Change in Mass from Existing (%)		0.03 (16%)	-0.022 (-12%)	0.92 (500%)
Change in Mass from Project (%)			-0.051 (24%)	0.89 (420%)
Total Chromium	1.5	2.2	1.6	11
Change in Mass from Existing (%)		0.7 (48%)	0.12 (8.1%)	9.4 (640%)
Change in Mass from Project (%)			-0.59 (-27%)	8.7 (400%)
Copper	2.8	4.3	3.5	24
Change in Mass from Existing (%)		1.5 (53%)	0.63 (22%)	21 (740%)
Change in Mass from Project (%)			-0.87 (-20%)	20 (450%)
Lead	6.6	10	8.9	64
Change in Mass from Existing (%)		3.4 (58%)	2.4 (36%)	58 (870%)
Change in Mass from Project (%)			-1.5 (-14%)	54 (520%)
Nickel	3.1	4.8	2.3	16
Change in Mass from Existing (%)		1.7 (55%)	-0.8 (-26%)	13 (410%)
Change in Mass from Project (%)			-2.5 (-52%)	11 (230%)
Zinc	24	27	17	120
Change in Mass from Existing (%)		3 (13%)	-6.6 (-27%)	98 (410%)
Change in Mass from Project (%)			-9.8 (-36%)	94 (350%)

Notes:

MG= million gallons; lb = pound; ac = acre
in = inch; yr = year

- While the percentage change reflects the incremental change that would occur in each analysis scenario, there is a level of imprecision associated with the load calculations. Therefore, all load values have been rounded to two significant figures to reflect the statistical uncertainty of the calculations. The significance of each change was evaluated by determining whether the change falls within the range of uncertainty.
- Based on drainage basin area and runoff coefficient data provided by KCA Engineers, Inc. and Hawk Engineers.
- Derived from unit load data found in Bay Area Stormwater Management Agencies Association, *San Francisco Bay Area Stormwater Runoff, Pollutant Monitoring Data Analysis, 1988 - 1995, Final Report*, prepared by Woodward-Clyde Consultants, October 15, 1996, Table 5-2.

Source: EIP Associates.

TABLE J.5 ●
ESTIMATED ANNUAL MASS COPPER LOADING TO NEAR-SHORE WATERS
FROM OVERFLOWS AND STORMWATER DISCHARGES

	Bayside Base Case + Project			Bayside Base Case + Mitigation A			Bayside Base Case + Mitigation B		
	Base Case	Mass Load	Change from Base Case (%)	Mass Load	Change from Base Case (%)	Change from Base + Project (%)	Mass Load	Change from Base Case (%)	Change from Base + Project (%)
Near-Shore Discharges from Project Area Plus other Bayside CSOs /a/ (lb/yr) /b/	> 300	> 300	2.1 (0.72%)	> 300	0.63 (0.21%)	-1.5 (-0.51%)	> 310	10 (3.4%)	8.1 (2.7%)
Bayside Overflows (lb/yr)	300	300	0.65 (0.22%)	300	0 (0%)	-0.65 (-0.22%)	290	-11 (-3.6%)	-11 (-3.8%)
Project Area Stormwater Discharge (lb/yr) /c/	2.8	4.3	1.5 (53%)	3.5	0.63 (22%)	-0.87 (-20%)	24	21 (740%)	20 (450%)
Other Bayside Stormwater Discharges	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Notes:

lb/yr = pounds per year
N.A. = not available

- Near-shore waters to the Project Area include China Basin Channel and the Bay waters adjacent to the Project Area.
- Data are not available from which to derive volumes and quality of direct stormwater discharges from outside the Project Area. The total load contributed by Bayside CSOs plus direct discharges of stormwater along the Bayside understates the actual total load discharged to near-shore waters. Therefore, the percentage changes shown for the project and Mitigation Scenarios A and B overstate the load changes from Base Case and Base-Case-plus-Project conditions.
- The copper load discharged under the Base Case, Project, and Mitigated Scenario A is much less than under Scenario B because under the first three, most of the Project Area stormwater would go to the combined sewer system.

Source: EIP Associates; City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c.

TABLE J.6 ●
ESTIMATED ANNUAL MASS ZINC LOADING TO NEAR-SHORE WATERS
FROM OVERFLOWS AND STORMWATER DISCHARGES

	Bayside Base Case + Project		Bayside Base Case + Mitigation A		Bayside Base Case + Mitigation B	
	Mass Load	Change from Base Case (%)	Mass Load	Change from Base Case (%)	Mass Load	Change from Base Case (%)
Near-Shore Discharges from Project Area Plus other Bayside CSOs /a/ (lb/yr) /b/						
	>2,400	>2,500 8.6 (0.35%)	>2,400 -6.6 (-0.27%)	-15 (-0.62%)	>2,500 10 (0.40%)	1.2 (0.049%)
Bayside Overflows (lb/yr)	2,400	2,400 5.3 (0.22%)	2,400 0 (0%)	-5.3 (-0.22%)	2,300 -88 (-3.6%)	-93 (-3.8%)
Project Area Stormwater Discharge (lb/yr) /c/	24	27 3.2 (13%)	17 -6.6 (-27%)	-9.8 (-36%)	122 98 (410%)	94 (350%)
Other Bayside Stormwater Discharges	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Notes:

lb/yr = pounds per year
N.A. = not available

- Near-shore waters to the Project Area include China Basin Channel and the Bay waters adjacent to the Project Area.
- Data are not available from which to derive volumes and quality of direct stormwater discharges from outside the Project Area. The total load contributed by Bayside CSOs plus direct discharges of stormwater along the Bayside understates the actual total load discharged to near-shore waters. Therefore, the percentage changes shown for the project and Mitigated Scenarios A and B overstate the load changes from Base Case and Base-Case-plus-Project conditions.
- The zinc load discharged under the Base Case, Project, and Mitigated Scenario A is much less than under Scenario B because under the first three, most of the Project Area stormwater would go to the combined sewer system.

Source: EIP Associates; City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c.

TABLE J.7 •
CUMULATIVE EFFLUENT, OVERFLOW, AND STORMWATER VOLUMES

	Existing Bayside Base Case	Cumulative Bayside Base Case with Project	Cumulative Bayside Base Case with Mitigation A	Cumulative Bayside Base Case with Mitigation B
Bayside Effluent (Deep Water) (MG/yr)	30,203	31,496	31,499	31,443
Near-Shore Discharges from Project Area Plus other Bayside CSOs /a/ (MG/yr)	> 926	> 1,024	> 1,021	> 1,077
Bayside Overflows (MG/yr)	910	1,008	1,005	970
Project Area Stormwater Discharge (MG/yr) /b/	15.6	15.9	15.9	107.2
Other Bayside Stormwater Discharge	N.A.	N.A.	N.A.	N.A.

Notes:

MG/yr = million gallons per year

N.A. = not available

- Near-shore waters to the Project Area include China Basin Channel and the Bay waters adjacent to the Project Area. Data are not available from which to derive volumes and quality of direct stormwater discharges from outside the Project Area. The sum of Bayside CSOs plus direct discharges of stormwater along the Bayside understates the actual total near-shore discharge volume. Therefore, the percentage changes shown for the project and Mitigated Scenarios A and B overstate the volume changes from Base Case and Base-Case-plus-Project conditions.
- The stormwater discharges under the Base Case, Project, and Mitigated Scenario A are much less than under Scenario B because under the first three, most of the Project Area stormwater would go to the combined sewer system.

Source: EIP Associates; City and County of San Francisco, Public Utilities Commission, Clean Water Program, *Draft Bayside Cumulative Impact Analysis*, March 1998, Table 5c.

K. CHINA BASIN CHANNEL VEGETATION AND WILDLIFE

This appendix includes two tables:

- Table K.1 China Basin Channel Benthic Invertebrate Species List
- Table K.2 Bird Species Observed in the Mission Bay Project Area

TABLE K.1
CHINA BASIN CHANNEL
BENTHIC INVERTEBRATE SPECIES LIST

Phylum Nemertea (ribbon worms)	Nemertea - unidentified <i>Cerebratulus californiensis</i>
Phylum Nematoda (roundworms)	Nematoda - unidentified
Phylum Sipuncula (peanut worms)	<i>Golfingia</i> species
Phylum Annelida (segmented worms)	
Class Oligochaeta (aquatic earthworms)	Oligochaeta - unidentified
Family Tubificidae	Tubificidae - unidentified <i>Tubificoides</i> species
Class Polychaeta (marine worms)	
Family Phyllodocidae (paddle worms)	<i>Eteone lighti</i>
Family Syllidae	<i>Sphaerosyllis californiensis</i>
Family Goniadidae	<i>Glycinde polygnatha</i>
Family Nephtyidae	<i>Nephtys cornuta franciscana</i>
Family Orbiniidae	<i>Lietoscoloplos elongatus</i>
Family Spionidae	Spionidae - unidentified juvenile <i>Polydora ligni</i> <i>Prionospio cirrifer</i> <i>Pseudopolydora kemp</i> <i>Pseudopolydora paucibranchiata</i> <i>Spiophanes berkeleyorum</i> <i>Spiophanes missioninsis</i> <i>Streblospio benedicti</i>
Family Cerratulidae (hairy-gilled worm)	<i>Aphelocheata</i> (= <i>Tharyx</i>) species <i>Chaetozone</i> spp. <i>Cirriiformia spirabrancha</i>
Family Cossuridae (thread worm)	<i>Cossura candida</i>
Family Opheliidae	<i>Armandia brevis</i>

(Continued)

TABLE K.1 (Continued)

Phylum Annelida

Class Polychaeta (continued)

Family Capitellidae

Capitellidae - unidentified (head fragment)
Capitella capitata ("pollution worm")
Heteromastus filiformis
Mediomastus species

Family Maldanidae (bamboo worms)

Sabaco elongatus

Family Pectinariidae (ice cream cone worms)

Pectinaria californiensis

Family Sabellidae (plumed worms)

Chone species

Phylum Arthropoda (jointed exoskeleton)

Class Crustacea (beach hoppers, shrimp, crabs, etc.)

Subclass Ostracoda (bean shrimp)

Eusarsiella zostericola

Subclass Copepoda

Order Harpacticoida

Harpacticoida - unidentified

Subclass Malacostraca

Order Cumacea

Eudorella pacifica

Nippoleucon (= *Hemileucon*) *hinumensis*

Order Amphipoda (beach hoppers)

Ampelisca abdita

Corophium heteroceratum

Phylum Mollusca

Class Gastropoda (snails)

Subclass Opisthobranchia (sea slugs, sea hares)

Philine species

Class Bivalvia (clams)

Subclass Heterodonta

Macoma balthica

Potamocorbula amurensis

Tellina modesta

Theora lubrica

Trachycardium quadragenarium

Phylum Echinodermata (sea stars)

Class Ophiuroidea (brittle stars)

Ophiuroidea - unidentified

Source: Susan McCormick, Aquatic Biologist, and KDH Biological Consulting.

TABLE K.2
BIRD SPECIES OBSERVED IN THE MISSION BAY PROJECT AREA

Common Name ¹	Scientific Name ²	Legal Status ³	Seasonal Occurrence ⁴	High Count	Primary Habitat		Observed Activity in Channel ⁶
					Upland	Channel ⁵	
Red-throated loon [a,b]	<u>Gavia stellata</u>		W	4		X	
Common loon [a,b]	<u>Gavia immer</u>		W	2		X	
Pied-billed grebe [a,b]	<u>Podilymbus podiceps</u>		R	2		X	
Horned grebe [a]	<u>Podiceps auritus</u>		W	4		X	
Eared grebe [d]	<u>Podiceps nigricollis</u>		W	2		X	
Western grebe [b]	<u>Aechmophorus occidentalis</u>		W	26		X	
Clark's grebe [a,b]	<u>Aechmophorus clarkii</u>		W	1		X	
California brown pelican [a,f]	<u>Pelecanus occidentalis californicus</u>	FE/CE	S	21		X	Foraging
Double-crested cormorant [a,b]	<u>Phalacrocorax auritus</u>		R	36		X	Perching, diving for fish
Brandt's cormorant [a]	<u>Phalacrocorax penicillatus</u>		R	6		X	
Pelagic cormorant [a]	<u>Phalacrocorax pelagicus</u>		R	2		X	
Great blue heron [a,b]	<u>Ardea herodias</u>		R	2		X	Resting
Great egret [a,b]	<u>Casmerodius albus</u>		R	3		X	Foraging, resting
Snowy egret [a]	<u>Ergetta thula</u>		R	2		X	Foraging
Green-backed heron [c]	<u>Butorides striatus</u>		R	N.A.		X	
Black-crowned night heron [a,b]	<u>Nycticorax nycticorax</u>		R	17		X	Foraging, resting
Muscovy duck	<u>Carina moschata</u>		E	1		X	Resting on bank
Mallard [b]	<u>Anas platyrhynchos</u>		R	N.A.		X	
Northern pintail [d]	<u>Anas acuta</u>		W	N.A.		X	

(Continued)

TABLE K.2 (Continued)

Common Name ¹	Scientific Name ²	Legal Status ³	Seasonal Occurrence ⁴	High Count	Primary Habitat		Observed Activity in Channel ⁵
					Upland	Channel ⁵	
Cinnamon teal [d]	<u>Anas cyanoptera</u>		S	N.A.		X	
Northern shoveler [d]	<u>Anas clypeata</u>		W	N.A.		X	
American wigeon [d]	<u>Anas americana</u>		W	N.A.		X	
Canvasback [d]	<u>Aythya valisineria</u>		W	N.A.		X	
Greater scaup [a]	<u>Aythya marila</u>		W	50		X	
Lesser scaup [a]	<u>Aythya affinis</u>		W	7		X	
Surf scoter [a,b]	<u>Melanitta perspicillata</u>		W	1,240		X	
Common goldeneye [a]	<u>Bucephala clangula</u>		W	10		X	
Barrow's goldeneye [a]	<u>Bucephala islandica</u>		W	6		X	
Bufflehead [a]	<u>Bucephala albeola</u>		W	3		X	
Ruddy duck [a]	<u>Oxyura jamaicensis</u>		W	1		X	
American kestrel [d]	<u>Falco sparverius</u>		R	1	X		
American Peregrine falcon [d]	<u>Falco peregrinus anatum</u>	FE/CE	R	1	X		
American coot [b]	<u>Fulica americana</u>		R	N.A.		X	
Black-bellied plover [a]	<u>Pluvialis squatarola</u>		W	1		X	
Killdeer [a,b]	<u>Charadrius vociferus</u>		R	6	X		Foraging along bank and mudflats
Black-necked stilt [d]	<u>Himantopus mexicanus</u>		R	N.A.		X	
American avocet [d]	<u>Recurvirostra americana</u>		R	N.A.		X	
Greater yellowlegs [d]	<u>Tringa melanoleuca</u>		W	N.A.		X	
Willct	<u>Catoptrophorus semipalmatus</u>		R	N.A.		X	

(Continued)

TABLE K.2 (Continued)

Common Name ¹	Scientific Name ²	Legal Status ³	Seasonal Occurrence ⁴	High Count	Primary Habitat		Observed Activity in Channel ⁶
					Upland	Channel ⁵	
Spotted sandpiper [a]	<u>Actitis macularia</u>		W	2		X	
Long-billed curlew [d]	<u>Numenius americanus</u>		R	N.A.		X	
Marbled godwit [d]	<u>Limosa fedoa</u>		W	N.A.		X	
Sanderling [a]	<u>Calidris alba</u>		W	150		X	
Western sandpiper [d]	<u>Calidris mauri</u>		W	N.A.		X	
Least sandpiper [a]	<u>Calidris minutilla</u>		W	23		X	
Dunlin [d]	<u>Calidris alpina</u>		W	N.A.		X	
Short-billed dowitcher [d]	<u>Limnodromus griseus</u>		R	N.A.		X	
Bonaparte's gull [a,b]	<u>Larus philadelphia</u>		W	1		X	
Heermann's gull [a,b]	<u>Larus heermanni</u>		S	3		X	
Mew gull [a,b]	<u>Larus canus</u>		W	1,375		X	
Ring-billed gull [a,b]	<u>Larus delawarensis</u>		R	4		X	
California gull [d]	<u>Larus californicus</u>		R	18		X	Resting, foraging, swimming
Herring gull [a]	<u>Larus argentatus</u>		W	2		X	
Thayer's gull [a]	<u>Larus thayer</u>		W	3		X	
Western gull [a,b]	<u>Larus occidentalis</u>		R	565		X	Feeding on carrion
Glaucous-winged gull [a,b]	<u>Larus glaucescens</u>		R	825		X	
Caspian tern [c]	<u>Sterna caspia</u>		S	1		X	Diving for fish
Forster's tern [a]	<u>Sterna forsteri</u>		R	2		X	Diving for fish
Rock dove (domestic pigeon) [a,b]	<u>Columba livia</u>		R	200	X		

(Continued)

TABLE K.2 (Continued)

Common Name ¹	Scientific Name ²	Legal Status ³	Seasonal Occurrence ⁴	High Count	Primary Habitat		Observed Activity in Channel ⁶
					Upland	Channel ⁵	
Mourning dove [a,b]	<u>Zenaidura macroura</u>		R	6	X		
Budgerigar (parakeet)	<u>Melopsittacus undulatus</u>		E	1	X		
Anna's hummingbird [c]	<u>Calypte anna</u>		R	N.A.	X		
Belted kingfisher [a,b]	<u>Ceryle alcyon</u>		R	3		X	
Black phoebe [a]	<u>Sayornis nigricans</u>		R	1	X		
Barn swallow [c]	<u>Hirundo rustica</u>		S	5	X		
American crow [a]	<u>Corvus brachyrhynchos</u>		R	6	X		
Common raven [a]	<u>Corvus corax</u>		R	1	X		Foraging for insects
Bushtit	<u>Psaltiriparus minimus</u>		R	2	X		
American robin [c]	<u>Turdus migratorius</u>		R	1	X		
Northern mockingbird [a,b]	<u>Mimus polyglottos</u>		R	3	X		
European starling [a,b]	<u>Sturnus vulgaris</u>		R	370	X		
Yellow-rumped warbler [a]	<u>Dendroica coronata</u>		R	5	X		
Palm warbler [d]	<u>Dendroica palmarum</u>		W	2	X		
Song sparrow	<u>Melospiza melodia</u>		R		X		
Golden-crowned sparrow [a]	<u>Zonotrichia atricapilla</u>		W	1	X		
White-crowned sparrow [a]	<u>Zonotrichia leucophrys</u>		R	4	X		
Red-winged blackbird [c]	<u>Agelaius phoeniceus</u>		R	N.A.	X		
Western meadowlark [a]	<u>Sturnella neglecta</u>		R	2	X		
Brewer's blackbird [a,b]	<u>Euphagus cyanocephalus</u>		R	23	X		
Hooded Oriole [e]	<u>Icterus cucullatus</u>		S	1	X		

(Continued)

TABLE K.2 (Continued)

Common Name ¹	Scientific Name ²	Legal Status ³	Seasonal Occurrence ⁴	High Count	Primary Habitat		Observed Activity in Channel ⁶
					Upland	Channel ⁵	
House finch [a,b]	<u>Carpodacus mexicanus</u>		R	17	X		
Pine siskin [a]	<u>Carduelis pinus</u>		R	1	X		
American goldfinch [a]	<u>Carduelis tristis</u>		R	1	X		
House sparrow [a,b]	<u>Passer domesticus</u>		R	35	X		
TOTAL:			(R = 45, W = 31, S = 6, E = 2)		27	57	
TOTAL SPECIES = 84							

Notes:

N.A. = Not Available

1,2 Names presented in phylogenetic order according to the American Birding Association's checklist in *Birds of the United States and Canada*, Fourth Edition, Colorado Springs, Colorado, 1990.

3 California Natural Diversity Data Base, California Department of Fish and Game, Sacramento, CA, 1997.

4 McCaskie, De Benedictis, Erickson and Morgan 1979, Birds of Northern California, An Annotated Field List.

W = winter range S = summer range

R = resident

E = exotic escape

Note: Seasons vary widely among different species.

Species recorded during field surveys March 5-6; 26; April 25 - May 1; August 25 - September 2, 1992; January 4-11, 1993; and June 6, 13, 19, 1997.

5 L = Lower channel

M = Middle channel

U = Upper channel

O = Open Water

S = Shoreline

6 Biological Surveys conducted by EIP Associates, June and July 1997, or other reliable observers.

Unless otherwise noted, data from EIP Associates surveys

[a] Observed during Audubon bird counts conducted by Alan Hopkins, September 1987 to February 1988.

[b] Observed during on-site bird censuses conducted by Environmental Science Associates (ESA) on February 18 and 26, and March 14, 1986.

[c] Observed by Alan Hopkins subsequent to his census conducted for the Mission Creek Conservancy.

[d] Data from CH M₂Hill Engineers, 1983, Mission Bay Project EIR, prepared for Jefferson Associates.

[e] Observed off-site at nest in palm, north side of Channel between 3rd and 4th streets. As foraging in this area is limited due to paving, foraging for insects and fruits likely occurs in the Project Area.

[f] Reported by Scott Morrill, Golden Gate Audubon in 1990 *Mission Bay FEIR*. High-flying birds that showed no apparent interest in the channel were not counted.

Sources: EIP Associates, Mission Creek Conservancy, 1990 Mission Bay FEIR, Environmental Science Associates.

L. COMMUNITY SERVICES AND UTILITIES

RECREATION AND PARKS

Plans and policies regarding the provision of open space in San Francisco are found in the *San Francisco General Plan* and in the Bay Conservation and Development Commission's *San Francisco Bay Plan* and *San Francisco Waterfront Special Area Plan*, as discussed below.

San Francisco General Plan

Recreation and Open Space Element

The Recreation and Open Space Element of the *San Francisco General Plan* sets forth plans and policies for San Francisco's recreation and open space system. Applicable objectives and policies of the Citywide, Neighborhood, Shoreline, and Regional sections are summarized below.

Citywide Objectives and Policies

Policy 1 of the Citywide System is to "provide an adequate total quantity and equitable distribution of public open spaces throughout the City."/^{1/} This policy states that there should be enough public open space to serve the City's population, and that this open space should be evenly distributed throughout the City. Policy 1 acknowledges that some areas of the City are deficient in open space, and that the City should work towards eliminating deficiencies and improving the distribution of open space./^{2/} The Mission Bay area is entirely outside of any service area shown on the map.

Policy 7 is to "acquire additional open space for public use."/^{3/} It states that additional public open space is needed in some areas, and should be acquired and/or developed. One such area, as shown on Map 4, page I.3.18 of the Recreation and Open Space Element, is the Mission Bay area.

Neighborhood Objectives and Policies

Objective 4 is to "provide opportunities for recreation and the enjoyment of open space in every San Francisco neighborhood."/^{4/} Relevant policies include the following: Policy 2, which is to maximize joint use of other properties and facilities; Policy 4, which gives priority to developing new open space in residential neighborhoods that are most deficient; Policy 5, which requires private usable outdoor open space in new residential development; Policy 6, which assures the provision of adequate

public open space to serve new residential development; and Policy 7, which calls for providing open space to serve neighborhood commercial districts./5/

Shoreline Objectives and Policies

Objective 3 is to “provide continuous public open space along the shoreline unless public access clearly conflicts with maritime uses or other uses requiring a waterfront location.”/6/ This objective includes policies to “assure that new development adjacent to the shoreline capitalizes on its unique waterfront location, considers shoreline land use provisions, improves visual and physical access to the water, conforms with urban design policies,” to “maintain and improve the quality of existing shoreline open space,” and to “provide new public open spaces along the shoreline.”/7/ Policy 5 of Objective 3 includes the Eastern Shoreline, which includes China Basin Channel, and parts of Mission Bay. Shoreline provisions that are part of the *Mission Bay Plan* are discussed below under “Mission Bay Area.”

Regional Open Space

Objective 1 is to “preserve large areas of open space sufficient to meet the long-range needs of the Bay Region.”/8/ These open spaces should provide recreation based on the natural features of the region, and supplement the types of open space and recreation available within the City.

Mission Bay Area

Mission Bay is part of the eastern shoreline, and the Recreation and Open Space Element states that “redevelopment of the Eastern Shoreline should be balanced so that adequate space is planned for public open space...”/9/

Mission Bay Plan

The *Mission Bay Plan* presents objectives and policies for the development of open space in Mission Bay. These include Policies 5 and 6 of Objective 1, which call for open space throughout the plan area, and land uses that provide access to and use of the shoreline./10/ It calls for approximately 68 acres of open space throughout Mission Bay./11/ The *Mission Bay Plan* contains an Open Space section, which describes the location, scale, and distribution of open space./12/ In addition, Objective 14 is to provide adequate open space for the Mission Bay community, as well as to augment the City’s open space network./13/

Central Waterfront Plan

Objective 9 under “Recreation and Open Space Access” in the *Central Waterfront Plan* is to “provide public access and recreational opportunities along the shoreline.”/14/ It contains policies to improve the quality of existing shoreline recreation areas, which include the nearby Agua Vista Park, and to provide open spaces with convenient pedestrian access in areas of maritime activity. Under “Central Basin Subarea,” Objective 17, Policy 2 is to improve and expand Agua Vista Park; and Policy 3 is to continue use of the public boat launch ramp south of Pier 50 or replace it with an equivalent along the eastern shoreline./15/

Bay Conservation and Development Commission

The Bay Conservation and Development Commission’s *San Francisco Bay Plan* recommends maximum public access to the Bay shoreline through the development of new shoreline parks and recreation facilities./16/ The *San Francisco Waterfront Special Area Plan* contains policies related to public access and open space along the waterfront, particularly with regard to public access requirements for new development./17/ More up-to-date policies are presented in the *San Francisco Bay Area Seaport Plan*, which is discussed further in “Regional Agencies” in Section V.A, Plans, Policies, and Permits: Setting. BCDC jurisdiction within the Project Area includes a 100-foot-wide shoreline band around the edge of the China Basin Channel. Public access requirements of this BCDC designation are discussed further in “Regional Agencies” under Section V.A, Plans, Policies, and Permits: Setting.

SCHOOLS

The following procedure was used to estimate the approximate number of school-age children expected to reside in the Project Area at full build-out. A projected citywide total population of 795,800 for the year 2015 was used, along with the following ABAG-projected age groups and populations in each group:/18/

Age	Projected Population, 2015
5-9	44,100
10-14	45,900
15-19	44,900

To arrive at the number of children in age groups that correspond approximately to school grades, the following steps were taken: The total number of children in each age group was divided equally among all of the ages in that group. Then this number was divided by citywide population to

determine the number of children of each age as a percentage of total population. Total projected Mission Bay population of approximately 10,900/19/ was multiplied by these percentages, to come up with a projected number of children of each age expected to live in the Project Area. Then each age was aligned with a school grade. The grades were then grouped by approximate school level to estimate the number of new students that would need to be accommodated at each school type. The results are shown in Table L.1.

SOLID WASTE

Solid Waste Estimates

The difference in the amount of solid waste estimated in the SEIR (19,000 tons/year, as shown in Table L.2) and in the 1990 FEIR (62,300 tons/year)/20/ can be attributed to the use of different waste generation factors, and slightly different land uses. The 1990 FEIR calculated waste generation by employment and residential populations. Although the SEIR uses population to calculate residential waste calculations, it uses gross floor area to calculate waste generation in retail and commercial industrial buildings.

The 1990 FEIR estimated approximately 34,600 tons of residential waste per year, while the SEIR estimates about 5.0 tons/year. The 1990 FEIR assumed 2.4 tons of solid waste per resident per year, or about 13 pounds per resident per day (lb/res/day). The SEIR uses a generation factor of 2.5 lb/res/day, which is approximately 0.46 ton per resident per year. The generation factor used in the SEIR comes from a 1985 report by the National Solid Wastes Management Association (NSWMA)/21/, and is very similar to the generation factor in San Francisco's 1992 Solid Waste Generation Study (2.4 lb/res/day)./22/ The difference in the amount of residential waste estimated to be generated in the two methods is approximately 29,000 tons per year.

The difference in solid waste generation estimates for the commercial sector is about 10,000 tons per year. The 1990 FEIR calculated commercial waste by using employee populations. The generation factor used in the 1990 FEIR (0.9 ton per person per year) was based on a San Francisco factor that estimated total commercial waste divided by total City employment. This SEIR uses waste generation factors obtained from the San Francisco Solid Waste Management Program, which are based on gross floor area by land use type. Calculation of commercial waste generation by land use is the more accurate method because it accounts for different waste generation rates from specific types of land use and, therefore, provides more accurate data.

TABLE L.1
CALCULATION OF APPROXIMATE NUMBER OF SCHOOL-AGE CHILDREN BY GRADE
EXPECTED TO RESIDE IN THE PROJECT AREA AT FULL BUILD-OUT, 2015

Age	Total Projected Children Citywide Year 2015 /a/	Number of Children by Age	Percent of Total Population /b/	Approximate School Grade	Projected Number of Children in Project Area by Grade/c/	Projected Number of Children in Project Area by School Type /d/	School Type
5		8,820	1.1%	K	120		
6		8,820	1.1	1	120		
7	44,100	8,820	1.1	2	120	731	Elementary School
8		8,820	1.1	3	120		
9		8,820	1.1	4	120		
10		9,180	1.2	5	131		
11		9,180	1.2	6	131		
12	45,900	9,180	1.2	7	131	393	Middle School
13		9,180	1.2	8	131		
14		9,180	1.2	9	131		
15		8,980	1.1	10	120	491	High School
16		8,980	1.1	11	120		
17	44,900	8,980	1.1	12	120		
18		8,980					
19		8,980					
Total number of school-age children expected to reside in the Project Area at full build-out						1,615	

Notes:

Numbers are rounded to the nearest whole number; percents to the nearest tenth.

Dotted lines at left show age groupings used by ABAG.

Solid lines at right show age groupings by school type.

- Association of Bay Area Governments, *Projections '96, Forecasts for the San Francisco Bay Area to the Year 2015*, December 1995, p. 216.
- This number arrived at by dividing the number of children at each age by the citywide projected population.
- This number arrived at by multiplying percent of population for each age by total projected population in Project Area.
- This assumes that an elementary school consists of grades K-5; a middle school, grades 6-8; and a high school, grades 9-12. The numbers of students in each grade were added to come up with a total number that would need to be accommodated at each type of school.

Source: EIP Associates.

TABLE L.2
MISSION BAY PROJECT SOLID WASTE GENERATION AT BUILD-OUT (2015)

Subarea	Land Use	Solid Waste Generation Factor/a,b/	Number of Units	Pounds per Day	Days per Year /d/	Pounds per Year	Tons per Year
North Subarea	Residential	2.5 lb/res/day	5,347 res	13,000	365	4,700,000	2,400
	Retail	2.0 lb/100 gsf/day	667,000 sf	13,000	365	4,700,000	2,400
	<i>Subtotal</i>			26,000			4,800
Central Subarea	Residential	2.5 lb/res/day	5,508 res	14,000	365	5,100,000	2,600
	Retail	2.0 lb/100 gsf/day	167,000 sf	3,300	365	1,200,000	600
	Hotel	2.0 lb/room/day	500 rooms	1,000	365	370,000	190
	<i>Subtotal</i>			18,000			3,400
East Subarea	Cmc. Industrial	1.0 lb/100 gsf/day	2,952,000 sf	30,000	260	7,800,000	3,900
	Retail	2.0 lb/100 gsf/day	340,000 sf	6,800	365	2,480,000	1,300
	<i>Subtotal</i>			37,000			5,200
West Subarea	Cmc. Industrial	1.0 lb/100 gsf/day	2,605,000 sf	26,000	260	6,800,000	3,400
	Retail	2.0 lb/100 gsf/day	333,000 sf	6,700	365	2,400,000	1,200
	<i>Subtotal</i>			33,000			4,600
UCSF Subarea	UCSF /e/	---	---	10,400	260	2,700,000	1,350
	Elem. School	0.5 lb/stu/day	500 stu/c/	250	217	54,000	27
	<i>Subtotal</i>			11,000			1,380
Total Yearly Solid Waste Generation /fl/g/							19,000
1996 Citywide Solid Waste Generation							1,115,673
% of Citywide Generation							1.7%

(Continued)

TABLE L.2 (continued)

Notes:

lb = pounds
du = dwelling unit
gsf = square feet
1 ton = 2,000 pounds

res = resident(s)
Cmc. Industrial = Commercial Industrial
stu = student(s)
Elem. School = Elementary School

- a. Source for Residential solid waste generation factors: City and County of San Francisco, *Solid Waste Generation Study*, October 1992, pp. 4-12.
- b. Source for Retail, Student, Commercial Industrial, and Hotel waste generation factors: NSWMA, Basic Data: Solid Waste Amounts, Composition, and Management, Technical Bulletin #85-6, October 1, 1985.
- c. Based on estimated school student capacity of 500 students.
- d. Days for schools based on 5 days/week and 10 months/year. Days for R&D/Office operations based on 52 five-day weeks per year.
- e. Waste generation for UCSF facility based on: University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, State Clearinghouse No. 95123032, January 1997, Volume Two, p. 455.
- f. Solid waste generated by police and fire fighting services is not included because accurate staff numbers are not available. The absence of this information is not expected to cause a large impact on the total annual solid waste generation for the project.
- g. Numbers may not add exactly due to rounding.

Source: EIP Associates.

The 1990 FEIR used a modified regression intercept to estimate the difference between the actual amount of solid waste generated in the Project Area in 1985 and the amount estimated by the population and employment projections.^{/23/} This regression produced a calibration factor of 5,210 tons per year. This SEIR did not need a calibration factor because the actual amount of solid waste generated in the Project Area was not obtained; existing waste generation was estimated based on land use types.

The differences in methods explained above account for a discrepancy of approximately 45,000 tons of solid waste per year between the 1990 FEIR and SEIR estimates (29,000 tons/year for population, 11,000 tons/year for employment, and about 5,000 tons/year for the calibration factor).

WATER SUPPLY

Estimates of Existing Water Demand

No change in land use that would cause a substantial change in water demand has occurred in Mission Bay since the 1990 FEIR, except for the addition of the Mission Bay Golf Center (a golf driving range) in December 1992. The SEIR estimate also assumes that there has been no large-scale replacement or upgrade of existing plumbing fixtures with more water-conserving ones. The current (1996) water estimate was calculated by adding the current water demand for Mission Bay from the 1990 FEIR (80,000 gallons per day, or gpd)^{/24/}, to the estimated water demand from the Mission Bay Golf Center (17,000 gpd).^{/25/} Therefore, the current (1996) water demand for Mission Bay is estimated to be about 97,000 gpd.

Estimates of Future Water Demand

The Mission Bay water demand estimate in the 1990 FEIR was 1,895,000 gpd, while this SEIR estimates the project's water demand to be 2,900,000 gpd. This represents an increase of about 1,000,000 gpd for the SEIR proposed development program. This difference is a result of more conservative estimates in commercial industrial water use, an increase in retail gross square footage, and a higher water demand for the irrigated open space.

In estimating the water demand for Commercial Industrial, all of the use was assumed to be R&D, which has a water use approximately three times greater than office water demand. This SEIR assumes 50% R&D and 50% office use for most of the analyses; therefore, the assumption of 100% R&D for water demand is very conservative. Alternative A from the 1990 FEIR estimated that 3.6 million gross sq. ft. of R&D and 4.1 million gross sq. ft. of office space would use approximately 690,000 gpd.^{/26/} The SEIR estimates that 5.56 million gross sq. ft. of Commercial Industrial space and the 2.65 million gross sq. ft. UCSF site would use approximately 1.3 million gallons per day (see Table L.3). Additionally, retail space has increased from 250,000 gross sq. ft. analyzed in the 1990

TABLE L.3
MISSION BAY PROJECT TOTAL DAILY WATER DEMAND AND
WASTEWATER GENERATION AT BUILD-OUT (2015), MISSION BAY NORTH AND SOUTH

Land Use	Building Floor Area (gsf)	Water Demand Factor /a/	Daily Water Demand (gal)	Daily Wastewater Generation (gal) /b/
Commercial Industrial	5,557,000	150 gal/1,000 gsf	830,000	750,000
UCSF /c/	2,650,000	N/A	510,000	460,000
Neighborhood-serving Retail	257,000	95 gal/1,000 gsf	24,000	22,000
Moderate Scale Retail	805,000	95 gal/1,000 gsf	76,000	68,000
Commercial Entertainment	445,000	150 gal/1,000 gsf	67,000	60,000
Community Facilities /d/	171,000	150 gal/1,000 gsf	26,000	23,000
	[du]			
Hotel, rooms	500	170 gal/du	85,000	77,000
Residential	6,090	187.5 gal/du	1,142,000	1,028,000
	[acre]			
Irrigated Open Space /e,f/	47	2,300 gal/acre	100,000	
Total Daily Demand (gal/day) /g/			2,900,000	2,500,000
Total Daily Demand (mgd) /h/			2.9	2.5
Existing Citywide Daily Consumption (mgd) /I/			90	84
% of Citywide Consumption (mgd)			3.2%	3.0%

Notes:

du = dwelling units

gsf = gross square feet

gal = gallons

mgd = million gallons per day

N/A = not available

- a. Factors based on information provided by Fred DeJarlais, Vice President, KCA Engineers, memorandum to EIP Associates, August 7, 1997. Water demand factors include water to be used for potentially non-potable uses (i.e., toilet flushing, cooling systems, and landscaping).
- b. Wastewater generation assumed to be 90% of water consumption.
- c. University of California San Francisco, *UCSF Long Range Development Plan Final Environmental Impact Report*, State Clearinghouse No. 95123032, January 1997, p. 464.
- d. Fire/police station, and school, assumes 75% coverage of site.
- e. City and County of San Francisco, San Francisco Public Utilities Commission, *Recycled Water Master Plan*, Table 3-1. Irrigation water demand factor is an annual average demand; water demand would be higher in the summer and lower in the winter.
- f. Water used for irrigation is assumed to seep into the soil, and, therefore, does not contribute to wastewater production.
- g. Numbers may not add exactly due to rounding.
- h. "Total Daily Demand" includes both potable and non-potable water demand.
- i. City and County of San Francisco, Planning Department, *San Francisco Kaiser Medical Center Geary Campus Development Project, Final Environmental Impact Report*, 95.102E, Volume I, April 10, 1997, pp. 215, 216.

Source: EIP Associates.

FEIR to 1,507,000 gross sq. ft. for the project, which represents an increase in water demand, from 23,750 gpd to about 170,000 gpd. The two differences described above account for an increased demand of approximately 900,000 gpd.

The water demand factor used in this SEIR for irrigating open space was 2,300 gallons per day per acre (gpd/acre), a yearly average./27/ The 1990 FEIR used a water demand factor of 300 gpd/acre./28/ The SEIR has slightly more open space than Alternative A in the 1990 FEIR. These differences are reflected in the increased water demand for irrigation in the SEIR (100,000 gpd) from that in the 1990 FEIR (12,990 gpd).

The 900,000 gpd variance due to the differences in Commercial Industrial uses and the increase in retail use, combined with the approximately 100,000 gpd difference for irrigation, account for a total increase over the 1990 FEIR of approximately 1,000,000 gpd.

Reclaimed Water

The daily demand for reclaimed water at build-out in Mission Bay North and Mission Bay South is shown in Table L.4.

TABLE L.4 ●
MISSION BAY PROJECT DAILY RECLAIMED WATER DEMAND AT BUILD-OUT (2015)
MISSION BAY NORTH AND SOUTH

Non-Irrigation Water Demand

Land Use	Building Floor Area (gsf)	Water Demand Factor /a/		Total Daily Demand (gal)
		Toilet Flushing	Cooling Systems /b/	
Commercial Industrial	5,557,000	17 gal/1,000 gsf	6 gal/100 gsf	430,000
UCSF /c/	2,650,000	N/A	N/A	0
Neighborhood-serving Retail	257,000	17 gal/1,000 gsf	6 gal/100 gsf	20,000
Moderate Scale Retail	805,000	17 gal/1,000 gsf	6 gal/100 gsf	62,000
Commercial Entertainment	445,000	17 gal/1,000 gsf	6 gal/100 gsf	34,000
Community Facilities /d/	171,000	17 gal/1,000 gsf	6 gal/100 gsf	13,000
Hotel /e/	480,000	N/A	6 gal/100 gsf	29,000
Hotel /f/	500 (rooms)	4.8 gal/room	N/A	2,400
<i>Subtotal-Non-Irrigation</i>				<i>590,000</i>

Irrigation Water Demand

	Area (acres)	Water Demand Factor /g/	Total Daily Demand (gal)
Irrigated Open Space/h/	47	2,300 gal/acre	100,000
Landscaping /i/		N/A	290,000
<i>Subtotal-Irrigation</i>			<i>390,000</i>

Total Non-Potable Water Demand (gal/day)/j/	980,000
Total Non-Potable Water Demand (mgd)	0.98
Total Potable Water Demand (mgd)	1.9
Project Citywide Potable Water Consumption (mgd) /k/	80.4
% of Citywide Potable Water Consumption (mgd)	2.4%

Notes:

du = dwelling units
gal = gallons
gsf = gross square feet
N/A = not available

- a. Dennis Gellerman, Principal Engineer, Montgomery Watson, facsimile to EIP Associates, August 20, 1997. Montgomery Watson prepared the *Recycled Water Master Plan* for the City and County of San Francisco.
- b. All buildings are assumed to have central cooling systems.
- c. UCSF projected non-potable water demand is not included in the total Daily Non-Potable Water Demand because UCSF indicates that it is not subject to San Francisco 390-91 and 391-91.

(Continued)

TABLE L.4 ● (continued)

Notes (continued):

- d. Assumes 75% coverage of site.
- e. Hotel water demand is divided due to different generation factors. Cooling system use is calculated by square footage, while toilet flushings are calculated by number of rooms.
- f. Based on 3 flushes/room/day on a 1.6 gal/flush toilet.
- g. City and County of San Francisco, San Francisco Department of Public Works and San Francisco Water Department, *Draft Recycled Water Master Plan*, July 1996, Table 3-1. Irrigation water demand factor is an average annual demand; water demand would be higher in the summer and lower in the winter.
- h. Irrigation value is a daily value averaged throughout the year. Water consumption may be higher in the summer and lower in the winter.
- i. Based on 10% of the total water demand. This is the amount of water that was eliminated from the wastewater generation total because it was assumed to be used for landscaping.
- j. The Total Non-Potable Water Demand estimate is a conservatively large value for the proposed project. All commercial buildings are assumed to have dual-piping; but some buildings may be smaller than 40,000 square feet, thus not requiring dual-piping. Additionally, Catellus engineers believe the cooling system water demand factor (6 gal/100 gsf) is relatively high.
- k. City and County of San Francisco, Planning Department, *San Francisco Recycled Water Master Plan and Groundwater Master Plan Final Environmental Impact Report*, 92.371E, November 1, 1996, p. 455.

Source: EIP Associates.

NOTES: Appendix L, Community Services and Utilities

1. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.7.*
2. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, pp. I.3.7, I.3.11.*
3. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.17.*
4. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.41.*
5. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, pp. I.3.41-I.3.50.*
6. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.25.*
7. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, pp. I.3.25-I.3.40.*
8. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.3.*
9. San Francisco Planning Department, *San Francisco General Plan*, Recreation and Open Space Element, p. I.3.37.*
10. San Francisco Planning Department, *San Francisco General Plan*, *Mission Bay Plan*, p. 3-1.*
11. San Francisco Planning Department, *San Francisco General Plan*, *Mission Bay Plan*, p. 3-3.*
12. San Francisco Planning Department, *San Francisco General Plan*, *Mission Bay Plan*, p. 3-37.*
13. San Francisco Planning Department, *San Francisco General Plan*, *Mission Bay Plan*, p. 3-37.*
14. San Francisco Planning Department, *San Francisco General Plan*, *Central Waterfront Plan*, p. II.8.11.*
15. San Francisco Planning Department, *San Francisco General Plan*, *Central Waterfront Plan*, p. II.8.15 - II.8.16.*
16. San Francisco Bay Conservation and Development Commission, *San Francisco Bay Plan*, January 1969 as amended, and with amendments since December 1988, p. 3.*
17. San Francisco Bay Conservation and Development Commission, *San Francisco Waterfront Special Area Plan*, April 1975 as amended.*
18. Association of Bay Area Governments, *Projections '96, Forecasts for the San Francisco Bay Area to the Year 2015*, December 1995, p. 216.

19. Hausrath Economics Group, Employment and Population Estimates for the Proposed Project and the Alternatives and Cumulative Growth Scenario for San Francisco and the Rest of the Region, 1995 - 2015, Memorandum to EIP Associates, August 7, 1997.
20. San Francisco Planning Department, *Mission Bay Final Environmental Impact Report*, Planning Department File No. 86.505E, State Clearinghouse No. 86070113, certified August 23, 1990, Volume Three, p. XIV.D.42.*
21. National Solid Wastes Management Association, Basic Data: Solid Waste Amounts, Composition and Management, *Technical Bulletin #85-6*, October 1, 1985.
22. City and County of San Francisco, *Solid Waste Generation Study*, prepared by Brown, Vence & Associates, October 1992, pp. 4-12.
23. 1990 FEIR, Volume Three, p. XIV.D.41.*
24. 1990 FEIR, Volume Two, p. VI.D.22.*
25. City and County of San Francisco, San Francisco Department of Public Works, *Recycled Water Master Plan*, Revised Draft, July 1996, Table 3-1.
26. 1990 FEIR, Volume Two, p. XIV.D.39.*
27. City and County of San Francisco, San Francisco Department of Public Works, *Recycled Water Master Plan*, Revised Draft, July 1996, Table 3-1.
28. 1990 FEIR, Volume Three, p. XIV.D.39.*

* A copy of this report is on file for public review at the Office of Environmental Review, Planning Department, 1660 Mission Street, San Francisco.



SOURCE: San Francisco Redevelopment Agency

